Geotechnics Incorporated

San Diego
El Centro
Riverside

REPORT OF SUBSURFACE INVESTIGATION
PASO PICACHO DAY USE AREA
CUYAMACA RANCHO STATE PARK
SAN DIEGO COUNTY, CALIFORNIA

prepared for

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by

GEOTECHNICS INCORPORATED
Project No. 0730-020-00
Document No. 08-0027

January 18, 2008

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Attention: Mr. Matt Dorman

SUBJECT: REPORT OF SUBSURFACE INVESTIGATION
Paso Picacho Day Use Area
Cuyamaca Rancho State Park
San Diego County, California

Dear Mr. Dorman:

In accordance with your request, we have completed a subsurface investigation and geotechnical evaluation for the proposed Day Use Area at the Paso Picacho Campground in San Diego County, California. This report presents the results of our investigation and provides recommendations for earthwork construction, and for the design of structures and pavements. Based on the results of our investigation, we consider the proposed construction feasible from a geotechnical standpoint.

We appreciate this opportunity to provide our professional services. If you have any questions or require additional services, please do not hesitate to contact us.

Respectfully submitted,
GEOTECHNICS INCORPORATED

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Principal

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1 INTRODUCTION

This report presents the results of our subsurface investigation and geotechnical evaluation for the Paso Picacho Day Use Area improvements in Cuyamaca Rancho State Park, San Diego County, California. The purpose of the subsurface investigation was to evaluate the physical characteristics of the soils below and adjacent to the proposed improvements and provide geotechnical recommendations regarding earthwork construction, bearing capacity of pipelines and associated structures, pavement support, and evaluations of seismic hazards and obvious site contamination. Recommendations for support of seismic loads are also provided. The conclusions and recommendations presented in this report are based on the subsurface conditions encountered during our field explorations, laboratory testing of selected soil samples collected from the site, and engineering analysis.

2 SCOPE OF SERVICES

The scope of services provided during this investigation was generally as described in our Proposal No. 07-022, dated February 27 (Document No. 07-0063), and included the following items:

1. Reviewed available published geologic maps, topographic maps, aerial photographs, and other literature pertinent to the geotechnical conditions at the proposed day use area.

2. Conducted a reconnaissance of the site and marked out boring locations for State Parks personnel to identify any subsurface utilities in the area. Contacted Underground Services Alert (USA) and obtained a Digalert Ticket Number.

3. Investigated the soil/groundwater conditions in the area of the proposed improvements by drilling six borings within the planned improvement area. The borings were advanced to depths of up to 5 feet below existing ground surface using a jeep mounted, 6-inch diameter, solid-stem auger drill rig. Selected soil samples were collected for laboratory testing. The borings were backfilled with soil cuttings.

4. Evaluated the engineering properties of the soils likely to affect construction of the proposed improvements by performing laboratory tests on selected samples obtained from the borings. Laboratory testing included soil pH and resistivity, soluble sulfate and chloride content, shear strength, maximum density, R-value, and expansion index.

5. Evaluated the potential geologic hazards that may affect the site, including groundwater conditions, faulting and seismicity, slope stability, settlement potential, and expansive soils.

6. Performed engineering and geologic analysis of the field and laboratory data in order to develop recommendations for site preparation within the improvement areas, including a discussion on the excavatibility of the soils that may be encountered, subgrade preparation, fill and backfill, and grading for pavements. In addition, we also provided recommendations for pipeline design, considering vertical and lateral load supporting capacities, allowable soil bearing pressures and anticipated settlement and seismic design parameters, and recommendations for pavement sections based on R-value tests

7. Prepared this report summarizing our findings, conclusions, and recommendations.

3 SITE DESCRIPTION AND PROPOSED IMPROVEMENTS

The proposed Paso Picacho Day Use Area is located adjacent to the Paso Picacho Campground within Cuyamaca Rancho State Park as shown on the Site Location Map, Figure 1. The proposed day use area will be located along the east side of Highway 79, across from the entrance to the Paso Picacho Campground area. The site is located in the Cuyamaca Mountains with an elevation difference of 4,875 to 4,900 feet above mean seal level (MSL) across the site. The site is covered with grass, brush, and large trees. An existing riding/hiking trail crosses the site in a north/south direction.

We understand that the proposed day use area will consist of a new vehicular turnout and parking area and associated improvements that may include portable restrooms, utilities, gravel and/or asphalt roads, trails, trailer storage, RV parking, storage yards, equestrian rings/pens, stables, waste areas, inlets, culverts, pipelines, and detention basins. We have assumed the design of any structures will be in accordance with the requirements of the 2007 California Building Code. We understand that a traditional bid type contract may be utilized for construction. The purpose of this investigation was to provide necessary information regarding the existing soil conditions that can be incorporated into the bid request.

4 GEOLOGY AND SUBSURFACE CONDITIONS

The site is located within the Peninsular Ranges geomorphic province of California. This province, which stretches from the Los Angeles basin to the tip of Baja California, is characterized as a series of northwest trending mountain ranges separated by subparallel fault zones, and a coastal plain of subdued landforms. The mountain ranges are underlain primarily by Mesozoic metamorphic rocks that were intruded by plutonic rocks of the southern California batholith, while the coastal plain is underlain by subsequently deposited marine and nonmarine sedimentary formations.

The subject site is located in the mountain ranges portion of the Peninsular Ranges geomorphic province. Specifically, the site is underlain by Cretaceous-age granitic rock that is mantled by surficial deposits of colluvium. Outcrops of granitic rock and “corestone” boulders were observed at ground surface in areas adjacent to the site. The site is located on the flanks of Stonewall Peak, named for it’s steep granitic rock slopes. Primary geotechnical concerns on site include the presence of compressible surficial soils, and the presence of hard rock in areas of proposed improvements. Generalized descriptions of the subsurface materials follow:

4.1 Granitic Rock

Undifferentiated granitic rock underlies the entire site at depth. The granitic rock was not encountered in any of the borings excavated at the site; however, shallow buried granitic rock may be encountered during site development in areas not explored. As observed in adjacent outcrops, the granitic rock is generally slightly to severely weathered. Where slightly weathered, the rock is generally light brown to brown in color, fine to coarse grained, and hard. If encountered during grading or in excavations, this material will likely require significant breaking and/or blasting to excavate. Where severely weathered, the rock is generally light brown to reddish orange in color, fine grained, and soft to firm. This material has the appearance of silty sand (decomposed granite), and is typically excavatable with a backhoe or tracked excavator. The severely weathered rock generally becomes harder and less weathered with depth. Corestones (boulders or floaters) and outcrops of intact, slightly weathered granitic rock may be encountered within the weathered granitic rock mass. The granitic rock is characterized by high bearing capacity and low compressibility. The soil generated from excavations in weathered rock material is anticipated to have a very low expansion potential.

4.2 Colluvium and Topsoil

Undifferentiated colluvium and topsoil mantles the underlying granitic rock and was encountered in all of the borings excavated at the site. Colluvium is an accumulation of soil and weathered granitic rock that forms on slopes as a result of slow downhill creep due to gravity. Topsoil is the fertile surficial soil that typically develops in place and contains organic material from the surficial vegetation. The colluvium was observed in the bottom of all of the exploratory borings excavated at the site. As observed in the borings, the colluvium consisted generally of silty sand (Unified Soil Classification: SM) apparently derived from the underlying weathered granitic rock. The silty sand is dark brown to reddish brown in color, fine to coarse grained, loose, and has a very low potential for expansion. The upper three feet generally contained a lot of roots and organic materials. The colluvium also contained variable amounts of sub angular gravel up to approximately ¾-inch in diameter. These materials are considered loose and not capable of supporting structural loads in their present condition.

4.3 Groundwater

Shallow groundwater was not encountered in any of the borings drilled during the subsurface investigation. However, it should be noted that the anticipated changes in irrigation and drainage associated with site development, rainfall runoff, or broken pipes may produce seepage or locally perched groundwater conditions at any location within the soil underlying the site. Since the prediction of the location and extent of future seepage or groundwater conditions is not possible, those conditions are typically mitigated if and when they occur. Recommendations for mitigation of nuisance groundwater during construction are provided in this report.

4.4 Photo-Ionization Detector Results

Soil Samples were scanned for volatile organic vapors using a Photo-Ionizing Detector (PID). Monitoring procedures are described in Appendix B. The monitoring results generally did not detect significant concentrations of volatile organic compounds from the samples. The test results are shown on the boring logs in Appendix B.

5 GEOLOGIC HAZARDS

The Paso Picacho area of Cuyamaca Rancho State Park is not located within an active faulting area, and no evidence of past faulting was found at the site, or in our review of geologic maps and literature. The geologic hazard that would most likely affect the site is strong ground shaking from seismic events on nearby active faults.

5.1 Seismicity and Ground Motion

According to the program TOPO!© (National Geographic Holdings, 2006), the site is located at a latitude of approximately 32.9608° north and a longitude of approximately 116.5788° west (Datum NAD83/WGS84). The Fault Location Map, Figure 3, shows the locations of known active faults within a 62.14-mile (100-km) radius of the site. Tables 1 and 2, Regional Seismicity, show the properties of these faults at the site. The deterministic values of the faults shown in the table were developed using the program EQFAULT (Blake, 2000) and published attenuation relationships for rock sites (Sadigh et al, 1997). The nearest known active fault is the Julian segment of the Elsinore Fault located approximately 6.6 miles (10.6 km) northeast of the site.

The historical site seismicity was evaluated using the program EQSEARCH (Blake, 2000). This program creates a listing of the locations, dates, and magnitudes of historical earthquakes, which may have occurred within 100 kilometers of the site, along with an Earthquake Recurrence Curve, generated from this data. The results of the EQFAULT and EQSEARCH analyses are presented in Appendix D.

The program FRISKSP (Blake, 2000) was used to perform a probabilistic analysis of seismicity at the subject site based on the characteristic earthquake distribution of Youngs and Coppersmith (1985) and an attenuation relationship for Rock (Sadigh et al, 1997). Based on the results of the probabilistic analysis, the Design Basis Earthquake defined as the motion having a 10 percent probability of being exceeded in a 50-year period; (475-year return period) produces a ground acceleration of 0.39g. The Upper Bound Earthquake, defined as the motion having a 10 percent probability of being exceeded in a 100-year period (979-year Return Period), produces a ground acceleration of 0.47g. The Maximum Considered Earthquake, defined as the motion having a 2 percent probability of being exceeded in a 50-year period (2,475-year Return Period), produces a ground acceleration of 0.58g. The data from the seismic analyses is presented in Appendix D.

5.2 Surface Rupture

Surface rupture is the result of movement on an active fault reaching the surface. The site is shown in relation to known active faults in the region on the Fault Location Map, Figure 3. The nearest known active fault is the Julian segment of the Elsinore Fault located approximately 6.6 miles (10.6 km) northeast of the site (CDMG, 1994; Jennings, 1994). There are no known active faults underlying the site or projecting toward the site. The site is not located within an Alquist-Priolo Earthquake Fault Zone. In our opinion, the probability of surface rupture due to faulting beneath the site is considered low. However, lurching and ground cracking are a possibility as a result of a significant seismic event on a nearby active fault.

5.3 Liquefaction and Dynamic Settlement

Liquefaction is a process in which soil grains in a saturated deposit lose contact due to earthquakes or other sources of ground shaking. The soil deposit temporarily behaves as a viscous fluid; pore pressures rise, and the strength of the deposit is greatly diminished. Liquefaction is often accompanied by sand boils, lateral spread, and post-liquefaction settlement as the pore pressures dissipate. Liquefiable soils typically consist of cohesionless sands and silts that are loose to medium dense, and saturated. Clayey soil deposits do not liquefy because the soil skeleton is not supported by grain-to-grain contact, and is therefore not subject to densification by shaking. To liquefy, soils must be subjected to a ground shaking of sufficient magnitude and duration. Given the topography of the site and absence of a shallow groundwater table, it is our opinion that the potential for localized liquefaction from ground shaking is negligible.

5.4 Subsidence

The subject site is not within an area known for fluid extraction (oil or water), nor is the area known for past cases of subsidence due to fluid removal (Alfors, 1973). It is our opinion that subsidence due to the extraction of fluids is negligible.

5.5 Landslides and Lateral Spreads

Lateral spreading is the result of liquefaction or plastic deformation occurring on gently sloping ground during an earthquake. Typically, the event requires an unsupported, steep cut or scarp at the toe of the failure area that allows the initial lateral displacement. Evidence of ancient landslides or slope instabilities was not observed within the planned improvement area during our investigation. Accordingly, the potential for landslides or lateral spreads to significantly impact the site is considered negligible.

5.6 Tsunamis, Seiches, Earthquake Induced Flooding, and General Flooding

Given the distance between the subject site and the coast, and the site's elevation above sea level (above 3,500 feet), the potential for damage due to tsunamis (seismically induced waves) is considered negligible. The site is not located adjacent to a lake or other body of water, therefore, the potential for damage due to seiches or earthquake induced flooding is negligible.

6 CONCLUSIONS

Based on the results of this investigation, it is our opinion that the proposed construction is feasible from a geotechnical standpoint provided the following recommendations and appropriate construction practices are followed. No geotechnical conditions were encountered that would preclude the proposed construction. Geotechnical design and construction considerations include the following:

- In general, excavations at the site should be achievable using standard heavy earthmoving equipment in good-working order with experienced operators. Granitic rock, if encountered may require rock breaking and/or blasting to excavate. If removal of trees is required, extra effort to remove all of the stump and roots may be necessary

- Groundwater was not encountered in the exploratory borings conducted for this report; however, localized zones of perched water may be encountered in after periods of moderate or heavy rainfall.

- Loose, compressible soils are found over much of the site. These materials, which include the colluvium and topsoil, may settle under increased loads, or due to an increase in moisture content from changes in irrigation or site drainage. Consequently, these materials should be excavated and replaced as compacted fill in areas that will be subjected to fill or structural loads, and in pavement areas. Remedial grading recommendations are contained in the following sections of this report.

7 RECOMMENDATIONS

The remainder of this report presents recommendations regarding earthwork construction as well as geotechnical recommendations for the design of the proposed structures and improvements. These recommendations are based on empirical and analytical methods typical of the standard-of-practice in southern California. If these recommendations appear not to address a specific feature of the project, please contact our office for additions or revisions to the recommendations.

7.1 Plan and Specification Review

Preliminary plans were not available at the time of this investigation. We recommend that improvement plans and specifications be reviewed by Geotechnics Incorporated prior to finalization to evaluate conformance of the plans with the intent of the recommendations of this report. Significant changes in the locations of the proposed improvements may require additional geotechnical evaluation.

7.2 Excavation and Grading Observation

Geotechnics Incorporated should provide observation and testing services continuously during earthwork construction. Such observations are considered essential to identify field conditions that differ from those anticipated by the investigation, to adjust designs to actual field conditions, and to determine that fill and/or backfill is placed in general accordance with the recommendations of this report. Recommendations presented in this report are contingent upon Geotechnics Incorporated performing such services. Our personnel should perform sufficient testing of fill during construction to support our professional opinion as to compliance with compaction recommendations.

7.3 Earthwork

Earthwork for the proposed development may include remedial grading of compressible soils, remedial grading of expansive soils, temporary trench excavations for underground utilities, and placement and compaction of fill, backfill, and pavement sections. Grading and earthwork should be conducted in accordance with the California Building Code (CBC), and with the recommendations of this report. The following recommendations are provided regarding specific aspects of the proposed earthwork construction. These recommendations should be considered subject to revision based on field conditions observed by the geotechnical consultant during construction.

7.3.1 Site Preparation

General site preparation should include the removal of unsuitable and deleterious materials, existing structures or pipelines, or other improvements from areas that will be subjected to structural or fill loads. Clearing and grubbing should consist of the removal of vegetation including brush, grass, weeds, wood, tree roots, and otherwise deleterious materials from areas to be graded. Clearing and grubbing should extend to the limits of grading. Unsuitable materials include vegetation, trash, construction debris, highly organic soil, rocks more than 6 inches in greatest dimension, contaminated soils, or other undesirable materials. Removed materials should be hauled off-site and legally disposed.

The removal of unsuitable materials should be conducted under the observation of the geotechnical consultant to evaluate the competency of the exposed materials for support of structural and fill loads. The excavation of unsuitable materials should be conducted in a way that minimizes the disturbance of competent materials.

All facilities, structures, foundations, utilities (above and below ground), and any other man-made improvements within the grading limits, that are not to be saved for future use, should be demolished and legally disposed off-site. Subsurface improvements or obstructions that are to be removed should be excavated and hauled off-site. The resulting excavations should be backfilled and compacted in accordance with the recommendations of this report. Demolition of pipelines may consist of capping or rerouting at the project perimeter, and removal within the project perimeter. If appropriate, abandoned pipelines may be filled with grout or slurry cement as recommended by, and under the observation of, the geotechnical consultant. Man-made improvements to be saved should be protected from damage by the contractor.

7.3.2 Remedial Grading

Compressible Soils: In general, the existing colluvium and topsoil is considered compressible and not suitable for the support of pavements and structural improvements such as retaining walls, and pipelines. Remedial grading is recommended where compressible soils are encountered within the proposed improvement areas or wherever the existing soils are disturbed due to demolition of existing structures or improvements, or tree removals. These soils should be removed and replaced as compacted fill to a depth of three feet below existing grade. The excavation bottoms should be observed by Geotechnics Incorporated personnel to evaluate the need for removals.

Expansive Soils: The existing sandy soils generally have a very low expansion potential. However, areas between borings, or areas not explored may contain moderately to highly expansive clays. If such soils are encountered, they should not be used in support of structures. We recommend that expansive materials be excavated and replaced with soils having a very low expansion potential (expansion index of 20 or less). The removals should extend to a minimum depth of 3 feet below the existing ground surface or planned pavement surface, whichever is deeper. Any sand or gravel layers installed as part of a bedding layer or pavement subgrade may be incorporated as part of the low expansion soil layer.

The replacement material may consist of on-site or imported soil with an expansion index of 20 or less, based on the guidelines of ASTM D4829. The replacement material should be compacted as recommended in this report.

7.3.3 Excavatibility

Excavations in the colluvium and topsoil at the site should generally be achievable using standard excavation equipment in good-working order with experienced operators. Rock breaking or blasting are not expected to be required unless shallow exposures of hard granitic rock are encountered. Material larger than 6 inches in maximum dimension is not considered suitable for use as fill.

7.3.4 Temporary Excavations

Temporary excavations are anticipated to be less than 10 feet in depth and are expected to be stable provided they are laid back in accordance with our recommendations or shored. All excavations should conform to Cal-OSHA guidelines. Workers should be protected from falling rocks, caving soils, and flooding in accordance with Cal-OSHA requirements. Temporary excavations extending to a depth of 3 feet or less may be made vertically. Temporary excavations up to 10 feet deep should be laid back no steeper than 1:1 (horizontal:vertical), or shored, prior to allowing workers to enter. Where temporary excavations extend below a plane inclined at 1½:1 (horizontal:vertical) downward from the outside bottom edge of adjacent existing structures, shoring is recommended. Should deeper temporary excavations be required, Geotechnics should be notified so that additional recommendations may be provided.

For temporary excavations that will be shored, but not braced with struts, we recommend using a triangular pressure distribution for calculating earth pressures. Cantilevered shoring design may be based on an equivalent fluid pressure of 40 pcf above water level and 85 pcf below water level, plus surcharge loads resulting from loads placed above the excavation and within a 1:1 plane extending upward from the base of the excavation. For design of soldier piles, an allowable passive pressure of 300 psf per foot of embedment (over twice the pile width) up to a maximum of 5,000 psf may be used. Soldier piles should be spaced at least two pile diameters on center.

7.3.5 Structural Fill Material

With the limitations noted below, the on-site materials may be used in the required structural fills, less any unsuitable or deleterious materials described previously. Soils that have an expansion index greater than 20 should not be used within 2 feet of pavement subgrade. Imported fill sources, if needed, should be observed prior to hauling onto the site to determine their suitability for use. Representative samples of imported materials and on-site soils should be tested by the geotechnical consultant to evaluate their engineering properties for the planned use. Imported fill soils should have an expansion index of no more than 20. Geotechnics should be notified to evaluate the suitability of these soils for use as fill and as finish grade soils.

7.3.6 Fill Compaction

After making the recommended removals and prior to fill placement, the exposed ground surface should be observed by Geotechnics Incorporated. Any remaining disturbed, loose, or soft materials should also be removed until a stable, unyielding condition under equipment loads is achieved.

All fill and backfill should be placed at slightly above optimum moisture content using equipment that is capable of producing a uniformly compacted product throughout the entire fill lift. Fill materials at less than optimum moisture should have water added and the fill mixed to result in material that is uniformly above optimum moisture content. Fill materials that are too wet should be aerated or mixed with drier material to achieve uniformly moisture-conditioned soil. Flooding or jetting should not be permitted as a method of compacting fill or backfill.

The fill and backfill should be placed in horizontal lifts at a thickness appropriate for the equipment spreading, mixing, and compacting the material, but generally should not exceed 8 inches in loose thickness. The minimum relative compaction recommended for fill and backfill is 90 percent of maximum dry density based on the guidelines of ASTM D1557. Sufficient observation and testing should be performed by Geotechnics Incorporated so that an opinion can be rendered as to the compaction achieved.

7.3.7 Bulk/Shrink Estimates

Based on our experience with similar materials, the colluvial soils are not anticipated to bulk or shrink significantly when excavated and compacted. However, it should be noted, that bulking and shrinking potential can vary considerably based on the variability of the in-situ densities of the materials in question.

7.4 Pipelines

Geotechnical aspects of pipeline design include soil bearing and lateral resistance for thrust blocks, modulus of soil reaction, and pipe bedding.

7.4.1 Thrust Blocks

For design of thrust blocks, the following design parameters may be used for thrust blocks embedded in compacted fill or alluvial materials.

Allowable Soil Bearing:	2,000 psf (allow a one-third increase for short-term wind or seismic loads).
Coefficient of Friction:	0.30
Passive Pressure:	300 psf per foot of embedment above standing groundwater and 150 psf per foot of embedment below standing groundwater (allow a one-third increase for short-term wind or seismic loads).

7.4.2 Modulus of Soil Reaction

The modulus of soil reaction (*E'*) is used to characterize the stiffness of soil backfill placed along the sides of buried flexible pipelines. For the purpose of evaluating deflection due to the load associated with trench backfill over the pipe, a value of 1,500 lbs/in^2 may be used assuming granular bedding material is placed adjacent to the pipe.

7.4.3 Pipe Bedding

Typical pipe bedding as specified in the "GREENBOOK" may be used. As a minimum, we recommend that pipes be supported on at least 4 inches of granular bedding material. Where pipeline or trench excavation inclinations exceed 15 percent, we do not recommend that open graded rock be used for pipe bedding or backfill because of the potential for piping and internal erosion of the overlying backfill. The recommended bedding is coarse sand having a sand equivalent greater than 30. Alternatively, sand-cement slurry can be used for the bedding.

The slurry should consist of at least a 2-sack mix having a slump no greater than 5 inches. If the sand-cement slurry is used for the pipe bedding to at least 1 foot over the top of the pipe, cut-off walls may not be considered necessary. This recommendation should be further evaluated by the project civil engineer designing the pipe system.

7.5 CBC Seismic Parameters for Structures

Based on the geology at the site, the following seismic parameters were estimated for the onsite soils in accordance with Table 1613.5.2 (Site Class Definitions) of the 2007 CBC. Deep soil borings were not taken to confirm the Site Class since no structures were proposed at the site.

2007 CBC

Site Class: C

Site Coefficients,	F_a:	1.0
	F_v:	1.3
Mapped MCE Spectral Accelerations,	S_S:	1.475
	S_1:	0.543
Adjusted MCE Spectral Accelerations,	S_{MS}:	1.475
	S_{M1}:	0.706
Design Spectral Accelerations,	S_{DS}:	0.984
	S_{D1}:	0.471

Since the soil properties were not investigated in sufficient detail to confirm the Site Class, the following default seismic parameters may be used for the onsite soils in accordance with Section and Table 1613.5.2 (Site Class Definitions) of the 2007 CBC.

2007 CBC

Site Class: D

Site Coefficients,	F_a:	1.0
	F_v:	1.5
Mapped MCE Spectral Accelerations,	S_S:	1.475
	S_1:	0.543
Adjusted MCE Spectral Accelerations,	S_{MS}:	1.475
	S_{M1}:	0.815
Design Spectral Accelerations,	S_{DS}:	0.984
	S_{D1}:	0.543

The following Seismic Design Categories may be used for structural design in accordance with S_{DS} and S_{D1} for Site Class D and Tables 1613.5.6 (1) and 1613.5.6 (2) of the Section 1613.5.6 of the 2007 CBC. Alternatively, the Seismic Design Categories may be determined in accordance with the Procedures described in Sections 1613.5.6 1 and 1613.5.6 2 of the 2007 CBC.

2007 CBC
Occupancy Category: All Categories (I through IV)
Seismic Design Category: D

7.6 Pavements

Preliminary pavement sections are provided for new pavements that will be associated with the proposed improvements. Final pavement design should be based on R-value test results of the finish pavement subgrade soils. Subgrade preparation should be conducted immediately prior to the placement of the pavement section. The upper 12 inches of pavement subgrade should be scarified, brought to about optimum moisture content and compacted to at least 95 percent of maximum dry density based on ASTM D1557 guidelines. Aggregate base should conform to the specifications for crushed aggregate base, crushed miscellaneous base, or processed miscellaneous base as defined in Section 200-2 of the “GREENBOOK.” Alternatively, base material may conform to Class 2 aggregate base as defined in Section 26 of the latest edition of the Caltrans Standard Specifications. Aggregate base should be compacted to at least 95 percent of maximum dry density based on ASTM D1557 guidelines.

7.6.1 Asphalt Concrete

Alternative paving sections for the access road and parking lot were established using the design criteria of Caltrans Topic 608.4. For this project, it was assumed that the parking lot may be designed for a maximum average daily traffic of 100 vehicles and no trucks or recreational vehicles (Maximum Traffic Index = 4.5) or for a maximum average daily traffic of 200 vehicles with less than 10 percent trucks or recreational vehicles (Maximum Traffic Index = 5.0). It was assumed that access roads may be designed for a maximum average daily traffic of 700 vehicles with less 10 percent trucks or recreational vehicles (Maximum Traffic Index = 5.5). The civil engineer should determine the anticipated daily traffic for design. R-Value testing performed on samples of the near surface colluvial soils indicate that the colluvial soils have R-Values of between 46 and 56. An R-Value of 40 was used for design. The actual subgrade R-Value should be confirmed during construction. Based on the indicated Traffic Indexes and a design R-value of 40, the following pavement sections were calculated in accordance with the Caltrans design method.

	Caltrans Design	
Traffic Index	**Asphalt**	**Aggregate Base**
4.5	3 inches	3 inches
5.0	3 inches	4 inches
5.5	3 inches	5 inches

Asphalt concrete should conform to "GREENBOOK" specifications. Asphalt concrete should be compacted to at least 95 percent based on the Hveem unit weight.

7.6.2 Portland Cement Concrete

Concrete pavement design was conducted in accordance with the simplified design procedure of the Portland Cement Association. This methodology is based on a 20-year design life. For design, it was assumed that aggregate interlock would be used for load transfer across control joints. The Portland cement concrete was assumed to have a minimum 28-day flexural strength of 600 psi. A "high" subgrade support (corresponding to a modulus of subgrade reaction between 180 and 220 pci) was assumed for design purposes. Based on these assumptions, we recommend that the pavement section consist of 6 inches of Portland cement concrete over the compacted subgrade.

Crack control joints should be placed on at least 10-foot centers, each way. During construction, the flexural strength of the concrete should be evaluated by making beams in accordance with ASTM C31 and testing for flexural strength in accordance with ASTM C78. Concentrated truck traffic areas should be reinforced with at least number 4 bars on 18-inch centers, each way.

7.7 Soil Corrosivity

Selected soil samples were evaluated for water-soluble sulfate content to assess the general degree of sulfate exposure of concrete in contact with the site soils. The test results are presented in Appendix C. The project design engineer may use the test results in conjunction with Table 4.3.1 of ACI 318 to specify a suitable cement type, water cement ratio, and minimum compressive strength for concrete used on site that will be in direct contact with soil, including all foundations and slabs. The sulfate content test results are believed to represent the existing soil conditions at the site. Additional testing of the finish grade materials should be performed to evaluate the final as-graded condition of the site. It should be noted that soluble sulfate in the irrigation water supply, and/or the use of fertilizer may cause the sulfate content in the surficial soils to increase significantly with time. This may result in a higher sulfate exposure than that indicated by the test results reported herein. Studies have shown that the use of improved cements in the concrete, and a low water-cement ratio will improve the resistance of the concrete to sulfate exposure.

Based on the resistivity test results, the on-site soils appear mildly to slightly corrosive to buried ferrous metals. Based on the results of the soluble chloride test results, the on-site soils are not corrosive to other buried metals. Based on the results of the pH test results, the on-site soils appear acidic and may be corrosive to metals. If additional recommendations are required for the design of buried piping, we recommend a Corrosion Engineer be retained to provide recommendations for the project.

8 LIMITATIONS OF INVESTIGATION

This report has been prepared for the exclusive use of Winzler & Kelly Consulting Engineers for specific application to the project described herein. The recommendations provided in this report are based on our understanding of the described project information and on our interpretation of the data collected during the subsurface exploration. The recommendations apply only to the specific project described in this report. In the event that any changes in the nature, design, or location of the facilities are planned from those described herein, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Geotechnics Incorporated. Geotechnics Incorporated is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the express written authorization of Geotechnics Incorporated.

This investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No warranty, express or implied, is made as to the conclusions and professional opinions included in this report.

The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface explorations. The samples taken and used for testing and the observations made are believed representative of the locations sampled; however, borings indicate subsurface conditions only at the specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between such locations. Soil and geologic conditions can vary significantly between field explorations. The validity of the recommendations is based in part on assumptions about the stratigraphy made by the geotechnical engineer. Such assumptions may be confirmed only during construction operations. In many projects, conditions revealed by excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by Geotechnics Incorporated and additional recommendations made, if warranted.

This report is issued with the understanding that it is the responsibility of the Winzler & Kelly Consulting Engineers, or of their designated representative, to ensure that the information and recommendations contained herein are incorporated into the plans, and the necessary steps are taken to see that the contractors carry out such recommendations in the field.

Changes in the condition of a property can occur with the passage of time, whether due to natural processes or the work of man on this or adjacent properties. In addition, changes in applicable or appropriate standards of practice may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

During final design, Geotechnics Incorporated should review the construction documents and specifications for the proposed project to assess their conformance with the intent of our recommendations. If changes are made in the project documents, the conclusions and represented in this report may not be applicable. Therefore, Geotechnics Incorporated should review any changes to assess whether the conclusions and recommendations are valid and modify them if required.

***

GEOTECHNICS INCORPORATED

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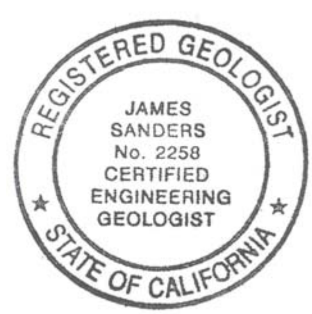
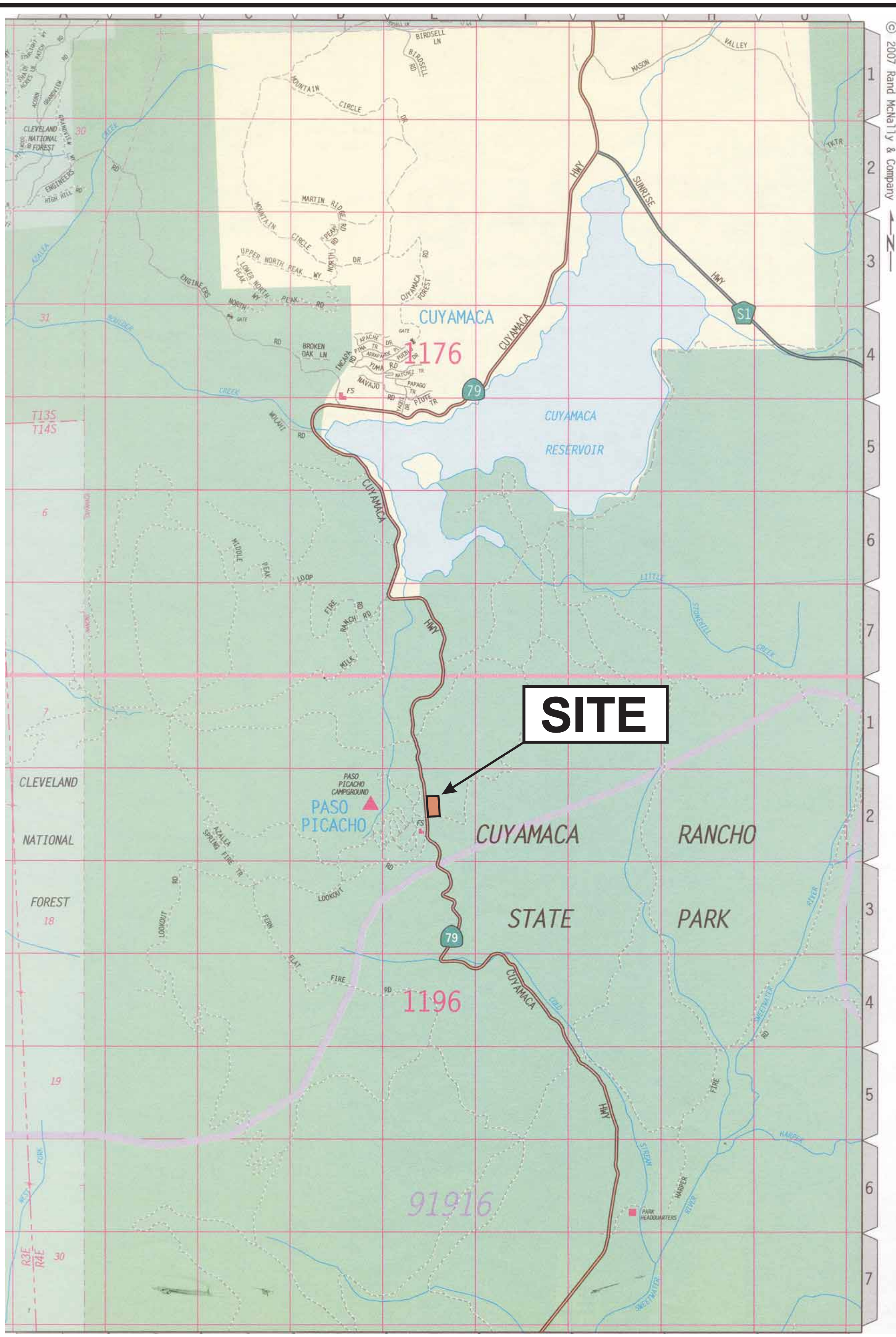


FAULT[1]	DISTANCE TO SITE [KM]	ESTIMATED PEAK GROUND ACCELERATION[2]	MAXIMUM EARTHQUAKE MAGNITUDE[3,5]	ESTIMATED FAULT AREA[4] [CM^2]	SHEAR MODULUS[4] [$DYNE/CM^2$]	ESTIMATED SLIP RATE[4] [MM/YEAR]
Elsinore (Julian)	11	0.37	7.1	1.14E+13	3.30E+11	5.0
Earthquake Valley	18	0.18	6.5	3.00E+12	3.30E+11	2.0
Elsinore (Coyote Mountain)	20	0.19	6.8	5.85E+12	3.30E+11	4.0
San Jacinto-Coyote Creek	44	0.08	6.8	6.15E+12	3.30E+11	4.0
San Jacinto - Borrego	45	0.06	6.6	3.48E+12	3.30E+11	4.0
San Jacinto-Anza	51	0.08	7.2	1.64E+13	3.30E+11	12.0
Rose Canyon	61	0.06	7.2	9.10E+12	3.30E+11	1.5
San Jacinto-Superstition Mtn.	62	0.04	6.6	2.88E+12	3.30E+11	5.0
Elsinore (Temecula)	62	0.05	6.8	6.45E+12	3.30E+11	5.0
San Jacinto-Superstition Hills	68	0.03	6.6	3.89E+12	3.30E+11	4.0
Elmore Ranch (West)	68	0.03	6.6	3.48E+12	3.30E+11	1.0
Laguna Salada	70	0.04	7.0	1.01E+13	3.30E+11	3.5
Elmore Ranch (East)	71	0.03	6.6	3.48E+12	3.30E+11	1.0
Coronado Bank	82	0.06	7.6	2.41E+13	3.30E+11	3.0
Newport-Inglewood (Offshore)	82	0.04	7.1	8.58E+12	3.30E+11	1.5
San Andreas - Sb-Coach. M-1B-2	88	0.06	7.7	2.43E+13	3.30E+11	27.0

1. Fault activity determined by Blake (2000), CDMG (1992), Wesnousky (1986), and Jennings (1994).
2. Median peak horizontal ground accelerations (in g's) from Sadigh et al (1997) for Rock Sites for the Maximum Earthquake Magnitude.
3. Moment magnitudes determined from CDMG (2003), Blake (2000), Wesnousky (1986) and Anderson (1984).
4. Estimated fault areas, shear moduli, and slip rates after fault data for EQFAULT and FRISKSP, Blake (2000).
5. The Maximum Earthquake Magnitude is the estimated median moment magnitude that appears capable of occuring given rupture of the entire estimated fault area.

FAULT[1]	DISTANCE TO SITE [KM]	ESTIMATED PEAK GROUND ACCELERATION[2]	MAXIMUM EARTHQUAKE MAGNITUDE[3,5]	ESTIMATED FAULT AREA[4] [CM^2]	SHEAR MODULUS[4] [$DYNE/CM^2$]	ESTIMATED SLIP RATE[4] [MM/YEAR]
San Andreas - Whole M-1A	88	0.07	8.0	6.86E+13	3.30E+11	30.0
San Andreas - Coachella M-1C-5	88	0.04	7.2	1.15E+13	3.30E+11	25.0
San Andreas - Sb-Coach. M-2B	88	0.06	7.7	2.43E+13	3.30E+11	24.0
Brawley Seismic Zone	92	0.02	6.4	2.52E+12	3.30E+11	25.0
San Jacinto-San Jacinto Valley	92	0.03	6.9	7.74E+12	3.30E+11	12.0
Imperial (Model A)	97	0.03	7.0	7.92E+12	3.30E+11	20.0
San Diego Trough	98	0.05	7.7	3.00E+13	3.30E+11	2.0

1. Fault activity determined by Blake (2000), CDMG (1992), Wesnousky (1986), and Jennings (1994).
2. Median peak horizontal ground accelerations (in g's) from Sadigh et al (1997) for Rock Sites for the Maximum Earthquake Magnitude.
3. Moment magnitudes determined from CDMG (2003), Blake (2000), Wesnousky (1986) and Anderson (1984).
4. Estimated fault areas, shear moduli, and slip rates after fault data for EQFAULT and FRISKSP, Blake (2000).
5. The Maximum Earthquake Magnitude is the estimated median moment magnitude that appears capable of occuring given rupture of the entire estimated fault area.



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SITE LOCATION MAP

Project No. 0730-020-00
Document No. 08-0027

FIGURE 1

EXPLANATION

B-6 Approximate location of boring

SCALE: 1" = 40'

Reference: X-TOPO-PASO.dwg and X-CB-PASO.dwg, provided by WINZLER & KELLY.

Project No. 0730-020-00
Document No. 08-0027

FIGURE 2

EXPLORATION PLAN

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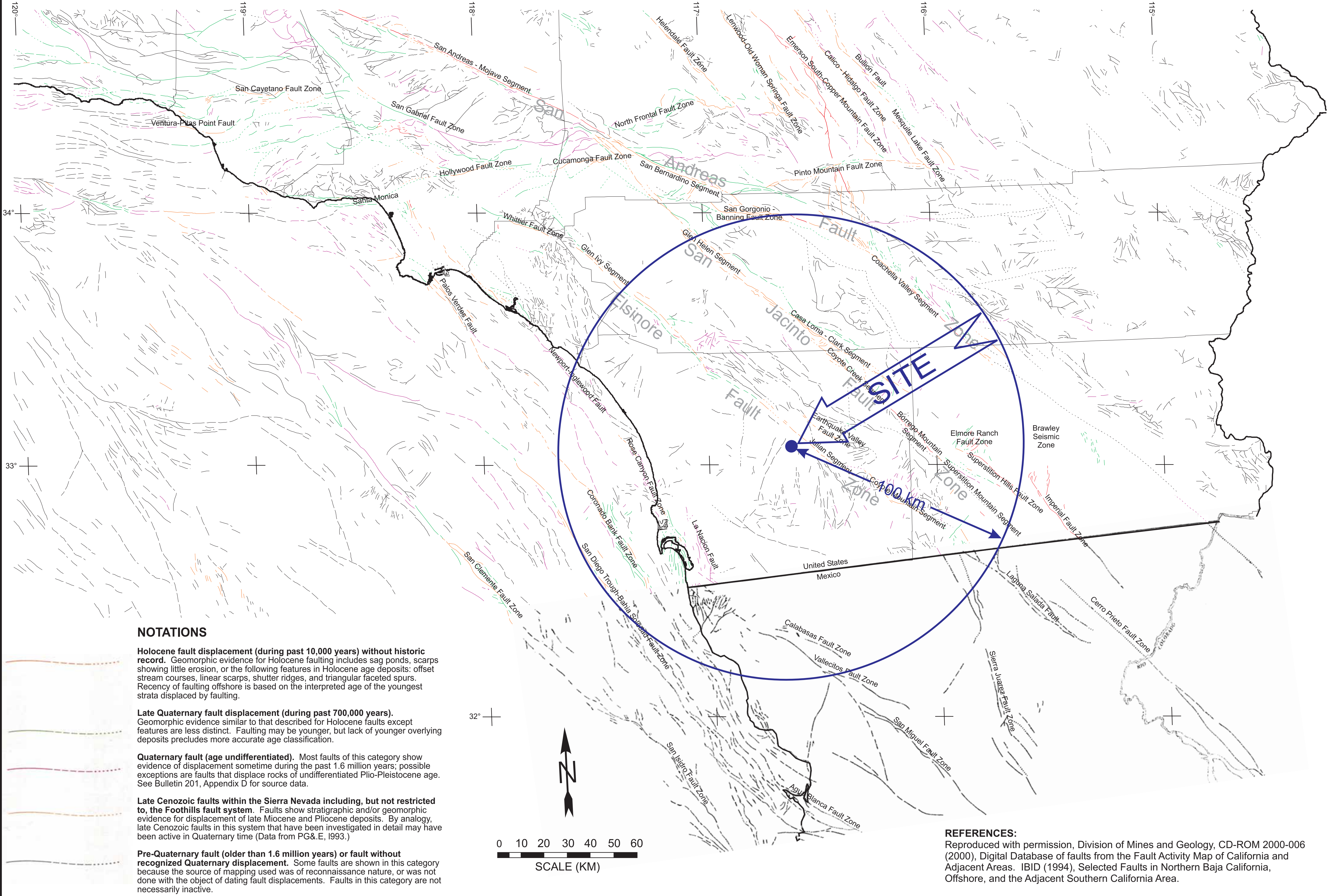

NOTATIONS

Holocene fault displacement (during past 10,000 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults that displace rocks of undifferentiated Plio-Pleistocene age. See Bulletin 201, Appendix D for source data.

Late Cenozoic faults within the Sierra Nevada including, but not restricted to, the Foothills fault system. Faults show stratigraphic and/or geomorphic evidence for displacement of late Miocene and Pliocene deposits. By analogy, late Cenozoic faults in this system that have been investigated in detail may have been active in Quaternary time (Data from PG&E, I993.)

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

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Project No. 0730-020-00
Document No. 08-0027

FIGURE 3

FAULT LOCATION MAP

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\Drafting\CorelDraw\Fault-SD Rev. 09/03

APPENDIX A

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APPENDIX A

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Youngs, R.R. and Coppersmith, K.J. (1985), Implications of Fault Slip Rates and Earthquake Recurrence Models to Probabilistic Seismic Hazard Estimates, Bulletin of the Seismological Society of America, vol. 75, no. 4, pp. 939-964.

APPENDIX B

SUBSURFACE EXPLORATION

Our field exploration consisted of drilling six exploratory borings with a jeep-mounted, solid-stem, continuous flight drill rig. Our field exploration was performed on December 27, 2007. The borings were approximately 6 inches in diameter and were drilled to a maximum depth of approximately 5 feet below existing grade. Bulk soil samples were collected from each boring, sealed in plastic bags, and returned to the laboratory for testing. Bulk soil samples are indicated on the logs with shading. The approximate boring locations are shown on the Exploration Plan, Figure 2. Logs describing the subsurface conditions encountered are presented on Figures B-1 through B-3.

To assess potential soil contamination on the site, samples obtained from the field exploration program were monitored for volatile organic compounds by taking headspace readings of bagged samples using a Photovac 2020 P.I.D. detector. Readings were taken by inserting the instrument probe into the bagged sample and monitoring until a stable reading was obtained. The instrument has a listed range of 0.5 to 2,000 parts per million (ppm) with a resolution of 1 ppm. The results of the monitoring are shown on the boring logs in Appendix B.

Boring locations were established in the field by taping distances from landmarks shown on the site plan and topographic map provided by Winzler & Kelly Consulting Engineers. The locations shown should not be considered more accurate than is implied by the method of measurement used. The lines designating the interface between soil units on the boring logs are determined by interpolation and are therefore approximations. The transition between the materials may be abrupt or gradual. Further, soil conditions at locations between the borings may be substantially different from those at the specific locations explored. It should be recognized that the passage of time can result in changes in the soil conditions reported in our logs.

LOG OF EXPLORATION BORING NO. B-1

Logged by: JCS | **Date:** 12/27/2007

Equipment Used: 6-inch diameter solid-stem auger | **Elevation:** 3891' MSL

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LAB TESTS
0–3	X	**COLLUVIUM:** Silty sand (SM), dark brown, fine to coarse, moist, loose, roots & organic debris. Photoionization Detector (PID) = 0.0	Sulfate Content Chloride Content pH & Resistivity Expansion Index
3–5	X	Reddish brown, few angular gravel to ¾-inch diameter, loose.	
5–10		Total depth: 5 feet No groundwater encountered	

LOG OF EXPLORATION BORING NO. B-2

Logged by: JCS | **Date:** 12/27/2007

Equipment Used: 6-inch diameter solid-stem auger | **Elevation:** 3884

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LAB TESTS
0–4	X	**COLLUVIUM:** Silty sand (SM), dark brown, fine to coarse, moist, loose, roots & organic debris. PID = 0.0	R-Value
4–5	X	Reddish brown, moist.	
5–10		Total depth: 5 feet No groundwater encountered	

LOG OF EXPLORATION BORING NO. B-3

Logged by: JCS **Date:** 12/27/2007
Equipment Used: 6-inch diameter solid-stem auger **Elevation:** 3895

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LAB TESTS
1–3		**COLLUVIUM:** Silty sand (SM), dark brown, fine to coarse, moist, loose, few gravel to ¾-inch diameter, roots & organic debris. PID = 0.0	Maximum Density Optimum Moisture Direct Shear
3–5		Reddish brown, fine to medium.	
5–10		Total depth: 5 feet No groundwater encountered	

LOG OF EXPLORATION BORING NO. B-4

Logged by: JCS **Date:** 12/27/2007
Equipment Used: 6-inch diameter solid-stem auger **Elevation:** 3890

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LAB TESTS
1–2.5		**COLLUVIUM:** Silty sand (SM), dark brown, fine to coarse, moist, few gravel and organic debris. PID = 0.0	R-Value
2.5–5		Reddish brown, fine to medium.	
5–10		Total depth: 5 feet No groundwater encountered	

LOG OF EXPLORATION BORING NO. B-5

Logged by: JCS **Date:** 12/27/2007

Equipment Used: 6-inch diameter solid-stem auger **Elevation:** 3893

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LAB TESTS
1–5	■	**COLLUVIUM:** Silty sand (SM), dark brown, fine to medium, moist, loose, roots & organic debris. PID = 0.0	Sulfate Content Chloride Content pH & Resistivity Expansion Index
5–10		Total depth: 5 feet No groundwater encountered	

LOG OF EXPLORATION BORING NO. B-6

Logged by: JCS **Date:** 12/27/2007

Equipment Used: 6-inch diameter solid-stem auger **Elevation:** 3881

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LAB TESTS
1–5	■	**COLLUVIUM:** Silty sand (SM), dark brown, fine to coarse, moist, loose, roots & organic debris. --- Reddish brown, fine to coarse, few angular gravel to ¾-inch diameter. PID = 0.0	R-Value
5–10		Total depth: 5 feet No groundwater encountered	

APPENDIX C

LABORATORY TESTING

Selected samples of soils encountered during the investigation were tested using generally accepted testing standards. The soils selected for testing are believed to be generally representative of the materials encountered during the investigation at the site; however, variations may occur in the soils at the site, and the materials tested may not be representative of the materials encountered during construction.

Laboratory testing was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions and in the same locality. No warranty, express or implied, is made as to the correctness or serviceability of the test results or the conclusions derived from these tests. Where a specific laboratory test method has been referenced, such as ASTM or Caltrans, the reference applies only to the specified laboratory test method and not to associated referenced test method(s) or practices, and the test method referenced has been used only as a guidance document for the general performance of the test and not as a "Test Standard." A brief description of the tests performed follows:

Classification: Soils were classified visually according to the Unified Soil Classification System as described in ASTM D2488. Visual classification was supplemented by laboratory testing of selected soil samples and classification in general accordance with the laboratory soil classification tests outlined in ASTM D2487. The resultant soil classifications are shown on the boring logs in Appendix B.

Maximum Density Optimum Moisture: The maximum dry density and optimum moisture content for a selected soil sample were estimated in general accordance with the laboratory procedures outlined in ASTM test method D1557, modified Proctor. The test results are summarized in Figure C-1.

Expansion Index: The expansion potential of selected soil samples was estimated in general accordance with the laboratory procedures outlined in ASTM D4829. The test results are given in Figure C-1.

R-Value: R-Value tests were performed on selected pavement subgrade materials in general accordance with the laboratory procedures outlined in ASTM test method D2844. The results are presented on Figure C-1.

APPENDIX C

LABORATORY TESTING (Continued)

Sulfate Content: To assess the potential for reactivity with below grade concrete, selected soil samples were tested for water-soluble sulfate content. The water-soluble sulfate was extracted under vacuum from the soil using a 10:1 (water to dry soil) dilution ratio. The extracted solution was then tested for water-soluble sulfate in general accordance with ASTM D516. The results are presented on Figure C-2.

pH and Resistivity: To assess the potential for reactivity with buried metal pipe and below grade ferrous materials, selected soil samples were tested for pH and resistivity in general accordance with the laboratory procedures outlined in Caltrans test method 643. The results are shown on Figure C-2.

Chloride Content: Selected soil samples were evaluated for water-soluble chloride content in general accordance with the Standard Method for Evaluation of Waste Water Test SMEWW4500CL^-C, which is conducted in general conformance with EPA Test Method 375.4. The test results are given in Figure C-2.

Remolded Direct Shear: The shear strength of selected recompacted soil samples was assessed through direct shear testing performed in general accordance with the laboratory procedures outlined in ASTM test method D3080. The samples were fabricated by compacting bulk samples of the onsite soils to approximately 90 percent of maximum dry density as determined in general accordance with the laboratory procedures outlined in ASTM test method D1557, modified Proctor. The samples were confined under vertical pressures in the laboratory approximately equal to the anticipated range of design effective overburden pressures. The samples were then inundated under water and sheared at a strain rate selected to approximate drained shear conditions. The results are summarized in Figure C-3.

MAXIMUM DENSITY/OPTIMUM MOISTURE CONTENT
(ASTM D1557)

SAMPLE NO.	SAMPLE DESCRIPTION	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE (%)
B-3 @ 0-5 feet	Dark reddish brown silty SAND	125	10

EXPANSION INDEX TESTS
(ASTM D4829)

SAMPLE NO.	SAMPLE DESCRIPTION	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 @ 0-5 feet	Dark reddish brown silty SAND	7	VERY LOW
B-5 @ 0-5 feet	Dark Brown silty SAND	0	VERY LOW

1997 UBC TABLE NO. 18-I-B, CLASSIFICATION OF EXPANSIVE SOIL

EXPANSION INDEX	POTENTIAL EXPANSION
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

R-VALUE TEST RESULTS
(ASTM D2844)

SAMPLE NO.	SAMPLE DESCRIPTION	R-VALUE
B-2 at 0 to 5 feet	Reddish brown silty SAND	48
B-4 at 0 to 5 feet	Reddish brown silty SAND	56
B-6 at 0 to 5 feet	Reddish brown silty SAND	46

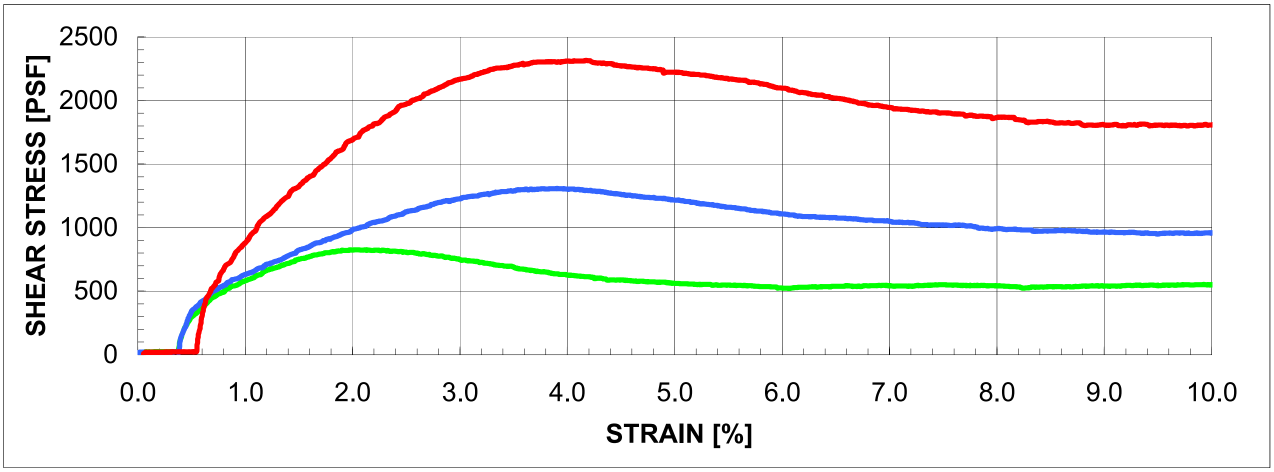
pH, RESISTIVITY, SULFATE AND CHLORIDE TEST RESULTS

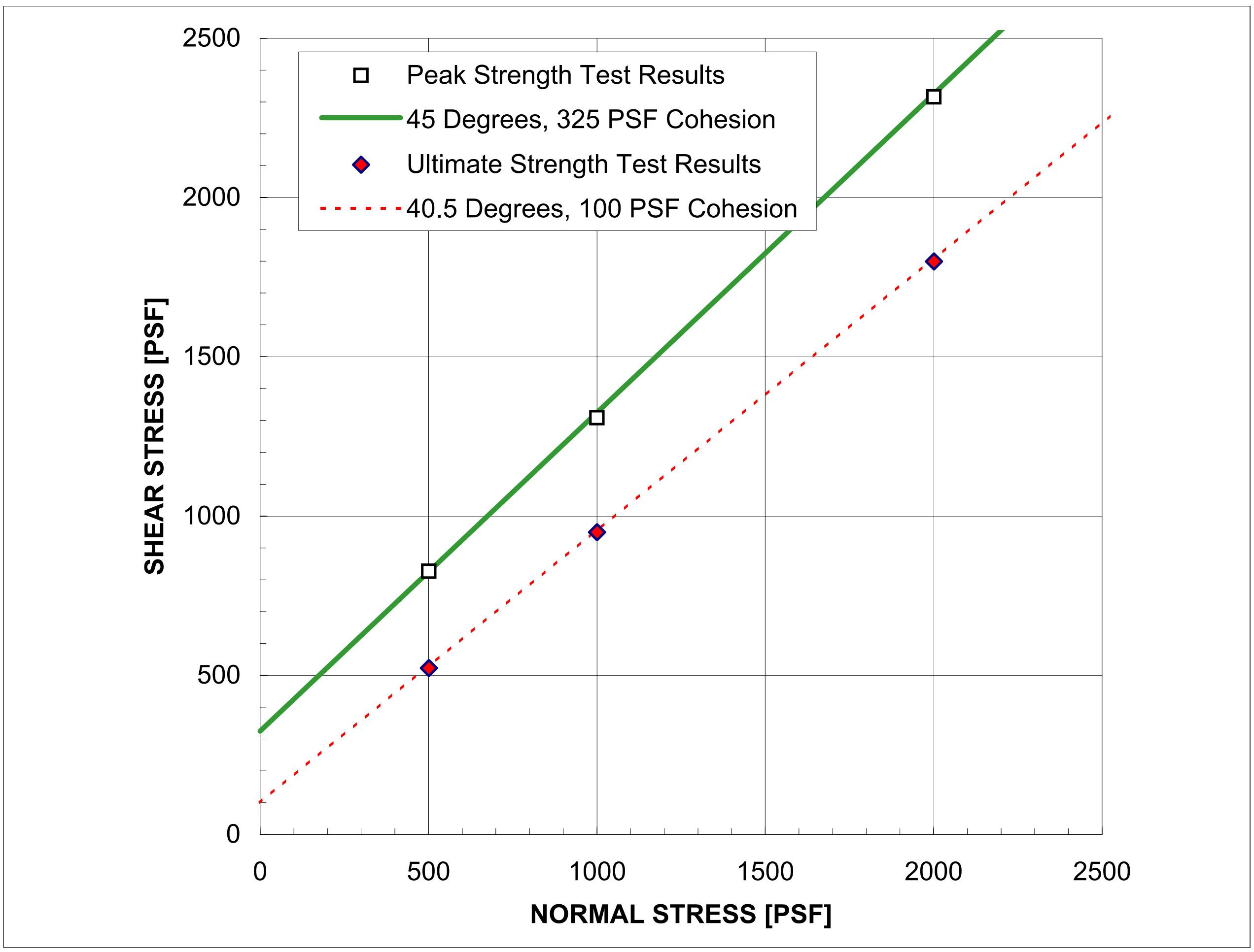
SAMPLE NO.	WATER-SOLUBLE SULFATE CONTENT (% of Dry Soil Weight) [ASTM D 516]	PH [CALTRANS 643]	RESISTIVITY (ohm-cm) [CALTRANS 643]	WATER-SOLUBLE CHLORIDE CONTENT (% of Dry Soil Weight) [SMEWW4500CL$^-$C]
B-1 at 0 to 5 feet	<0.01	5.67	8892.8	<0.01
B-5 at 0 to 5 feet	<0.01	6.10	18420.8	<0.01

Soil Resistivity in ohm-cm	General Degree of Corrosivity to Ferrous Metal
0 to 1,000	Very Corrosive
1,000 to 2,000	Corrosive
2,000 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
Greater than 10,000	Slightly Corrosive

Water Soluble Chloride (Cl) Content in % of Dry Soil Weight	General Degree of Corrosivity to Metal
Over 0.15 %	Severely Corrosive
0.15 % to 0.03 %	Corrosive
0.03 % to 0.00 %	Negligible

Water Soluble Sulfate (SO_4) Content in % of Dry Soil Weight	General Degree of Reactivity with Concrete
Over 2.00 %	Very Severely Reactive
2.00 % to 0.20 %	Severely Reactive
0.20 % to 0.10 %	Moderately Reactive
0.10 % to 0.00 %	Negligible





SAMPLE: B-3 at 0-5 ft.

COLLUVIUM: Silty Sand (SM)
(sample compacted to 90% ASTM D1557)

	PEAK	ULTIMATE
ϕ'	45 °	40.5 °
C'	325 PSF	100 PSF

STRAIN RATE: 0.0050 IN/MIN

(Sample was inundated, consolidated, and drained)

	IN-SITU	AS-TESTED
γ_d	112.6 PCF	112.6 PCF
w_c	9.6 %	18.1 %

Geotechnics Incorporated

DIRECT SHEAR TEST RESULTS

Project No.0730-020-00
Document No. 08-0027
FIGURE C-3

APPENDIX D

SEISMIC DATA

Seismic analysis was conducted for the subject site in order to develop parameters for structural design. This appendix presents the raw data from our analysis from three commercially available computer programs, EQFAULT, EQSEARCH, and FRISKSP (Blake, 2000). All three analyses used the same published attenuation relationship for rock sites (Sadigh et. al., 1997).

EQFAULT: The program EQFAULT was used to develop the deterministic peak ground acceleration as presented in Regional Seismicity, Tables 1 and 2. The results are presented in Appendix D.

EQSEARCH: The program EQSEARCH was used to generate a table of estimated characteristics of nearby seismic events, which were recorded between 1800 and 2005. This table is presented in Appendix D, and shows the epicenters, magnitudes, and dates of these nearby earthquakes, along with the estimated peak ground acceleration for the site, and a recurrence curve generated from the data.

FRISKSP: The program FRISKSP was used to perform a probabilistic analysis of seismicity at the subject site based on the characteristic earthquake distribution of Youngs and Coppersmith (1985). The results are also presented in Appendix D. The probabilistic analysis was used to define the Design Basis, Upper Bound, and Maximum Considered Earthquakes at the site for use in structural design. Note that the graphs do not incorporate Magnitude Weighting Factors and represent the probabilistic values presented in the text of this report.

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                    *                    *
                    *     Version 3.00   *
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 0730-020-00
DATE: 01-17-2008

JOB NAME: Cuyamaca-Paso Picacho

CALCULATION NAME: Test Run Analysis

FAULT-DATA-FILE NAME: C:\Program Files\EQFAULT1\cgseq03n.dat

SITE COORDINATES:
   SITE LATITUDE: 32.9608
   SITE LONGITUDE: 116.5788

SEARCH RADIUS: 62.14 mi

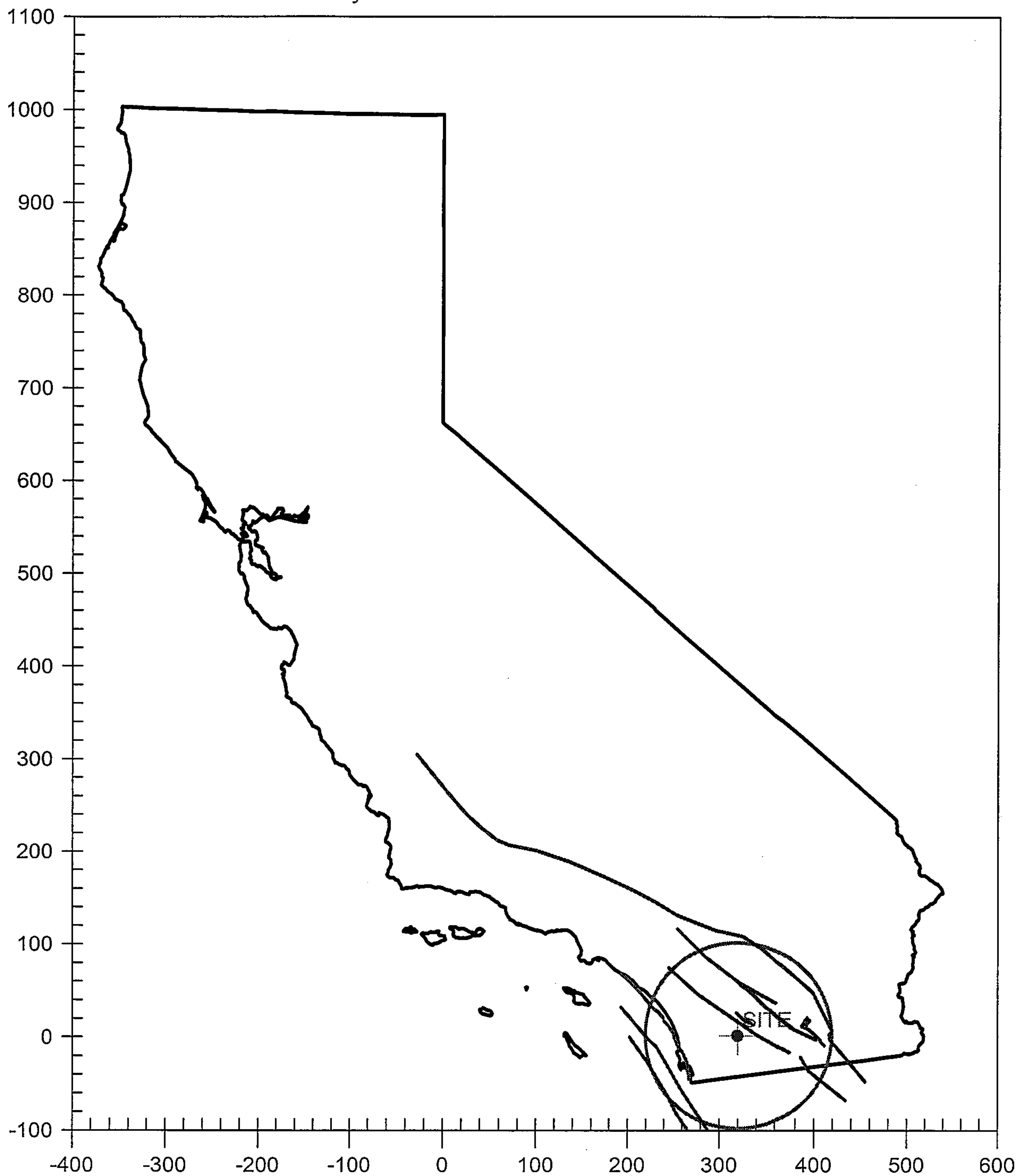
ATTENUATION RELATION: 21) Sadigh et al. (1997) Horiz. - Rock
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   DISTANCE MEASURE: clodis
   SCOND: 1
   Basement Depth: 5.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\Program Files\EQFAULT1\cgseq03n.dat

MINIMUM DEPTH VALUE (km): 0.0

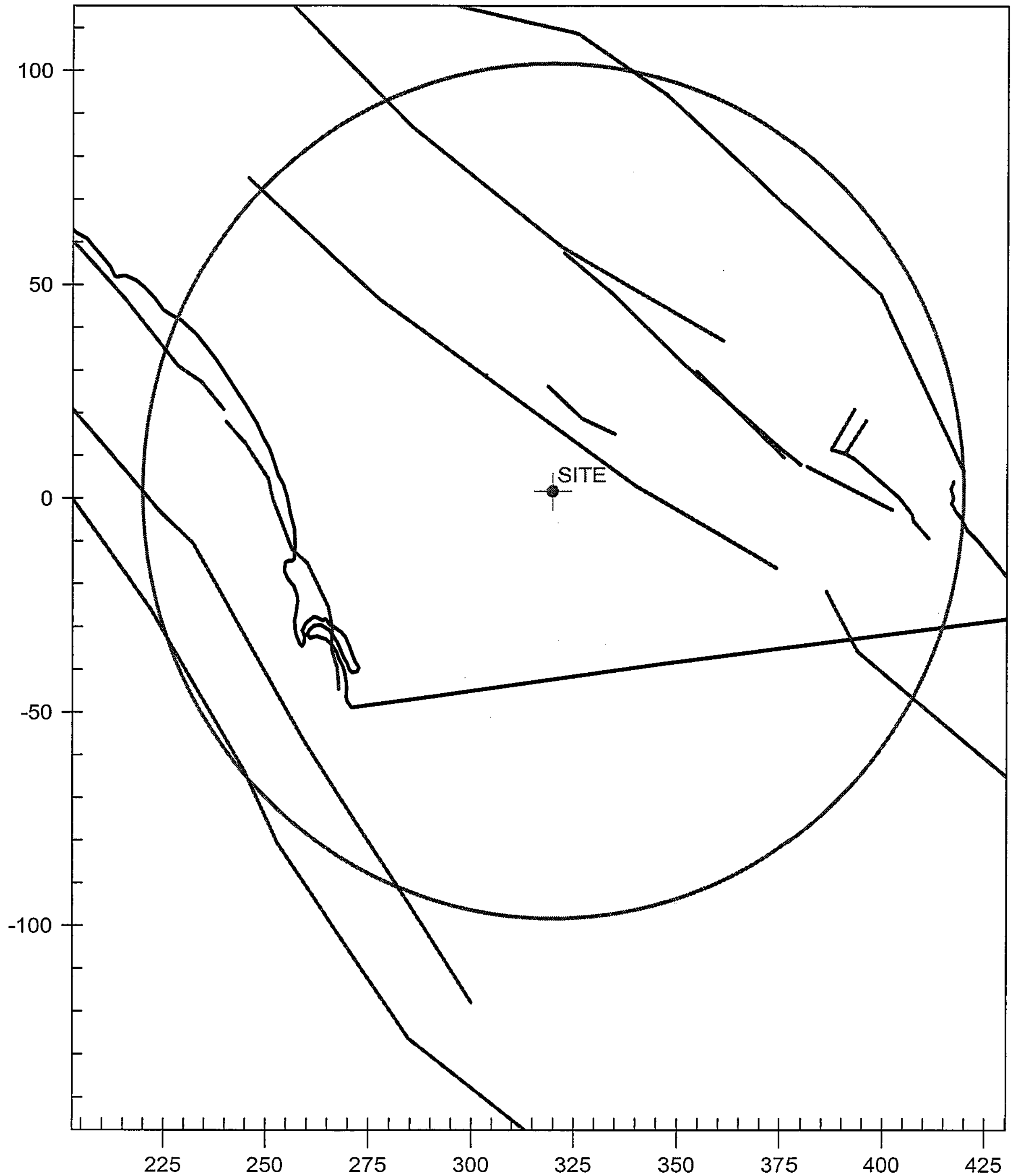
CALIFORNIA FAULT MAP

Cuyamaca-Paso Picacho



CALIFORNIA FAULT MAP

Cuyamaca-Paso Picacho



EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

Page 1

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
ELSINORE (JULIAN)	6.6(10.6)	7.1	0.372	IX
EARTHQUAKE VALLEY	11.4(18.4)	6.5	0.182	VIII
ELSINORE (COYOTE MOUNTAIN)	12.6(20.2)	6.8	0.194	VIII
SAN JACINTO-COYOTE CREEK	27.0(43.5)	6.8	0.077	VII
SAN JACINTO - BORREGO	27.8(44.7)	6.6	0.064	VI
SAN JACINTO-ANZA	31.6(50.9)	7.2	0.083	VII
ROSE CANYON	37.7(60.7)	7.2	0.064	VI
SAN JACINTO-SUPERSTITION MTN.	38.2(61.5)	6.6	0.039	V
ELSINORE (TEMECULA)	38.2(61.5)	6.8	0.046	VI
SAN JACINTO-SUPERSTITION HILLS	42.3(68.0)	6.6	0.033	V
ELMORE RANCH (WEST)	42.3(68.0)	6.6	0.033	V
LAGUNA SALADA	43.6(70.1)	7.0	0.044	VI
ELMORE RANCH (EAST)	44.3(71.3)	6.6	0.031	V
CORONADO BANK	50.6(81.5)	7.6	0.057	VI
NEWPORT-INGLEWOOD (OFFSHORE)	51.1(82.2)	7.1	0.037	V
SAN ANDREAS - SB-Coach. M-1b-2	54.4(87.5)	7.7	0.055	VI
SAN ANDREAS - Whole M-1a	54.4(87.5)	8.0	0.069	VI
SAN ANDREAS - Coachella M-1c-5	54.4(87.5)	7.2	0.037	V
SAN ANDREAS - SB-Coach. M-2b	54.4(87.5)	7.7	0.055	VI
BRAWLEY SEISMIC ZONE	57.0(91.7)	6.4	0.017	IV
SAN JACINTO-SAN JACINTO VALLEY	57.3(92.2)	6.9	0.026	V
IMPERIAL (MODEL A)	60.0(96.5)	7.0	0.026	V
SAN DIEGO TROUGH	60.8(97.8)	7.7	0.047	VI

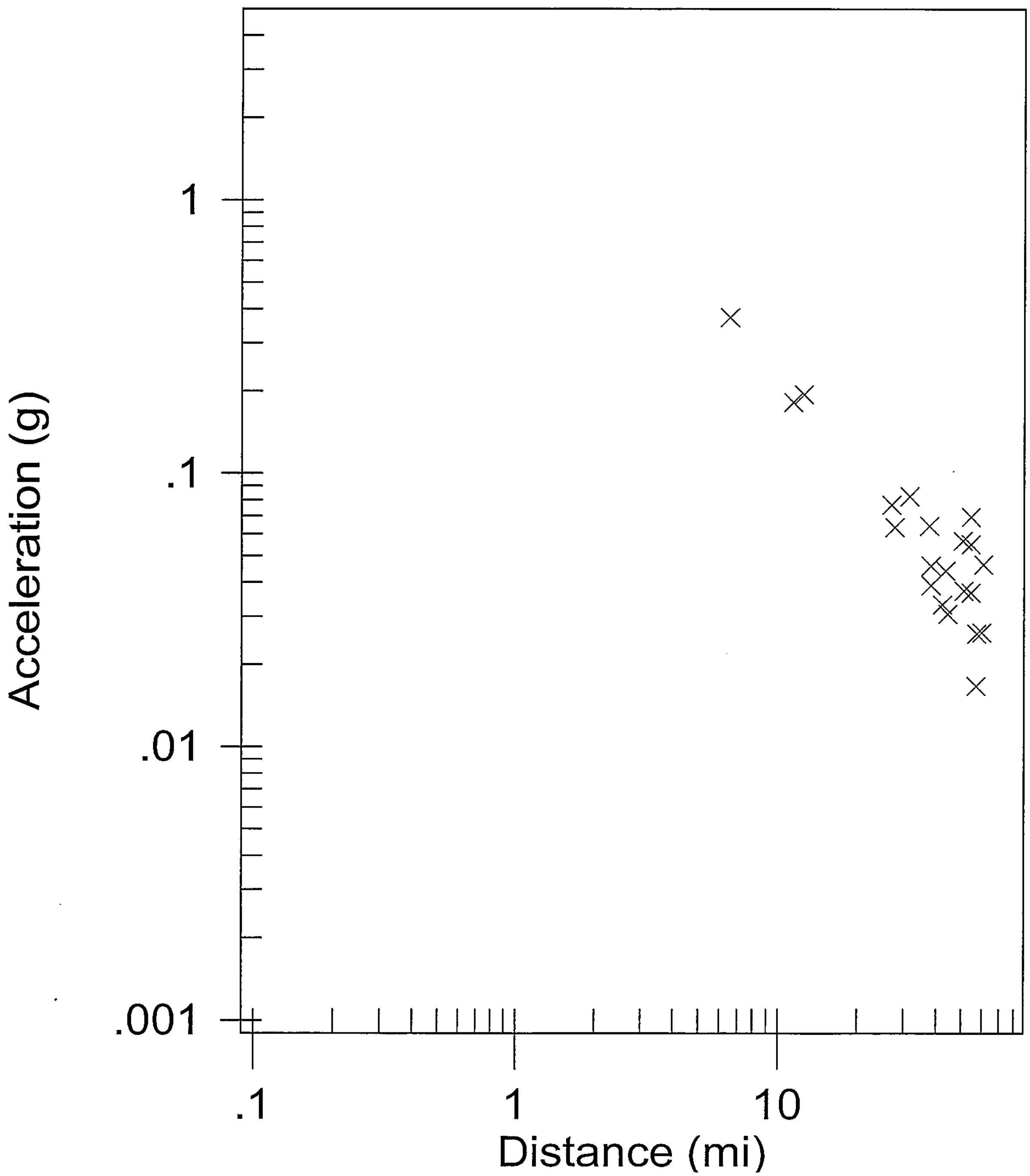
-END OF SEARCH- 23 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE ELSINORE (JULIAN) FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 6.6 MILES (10.6 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.3718 g

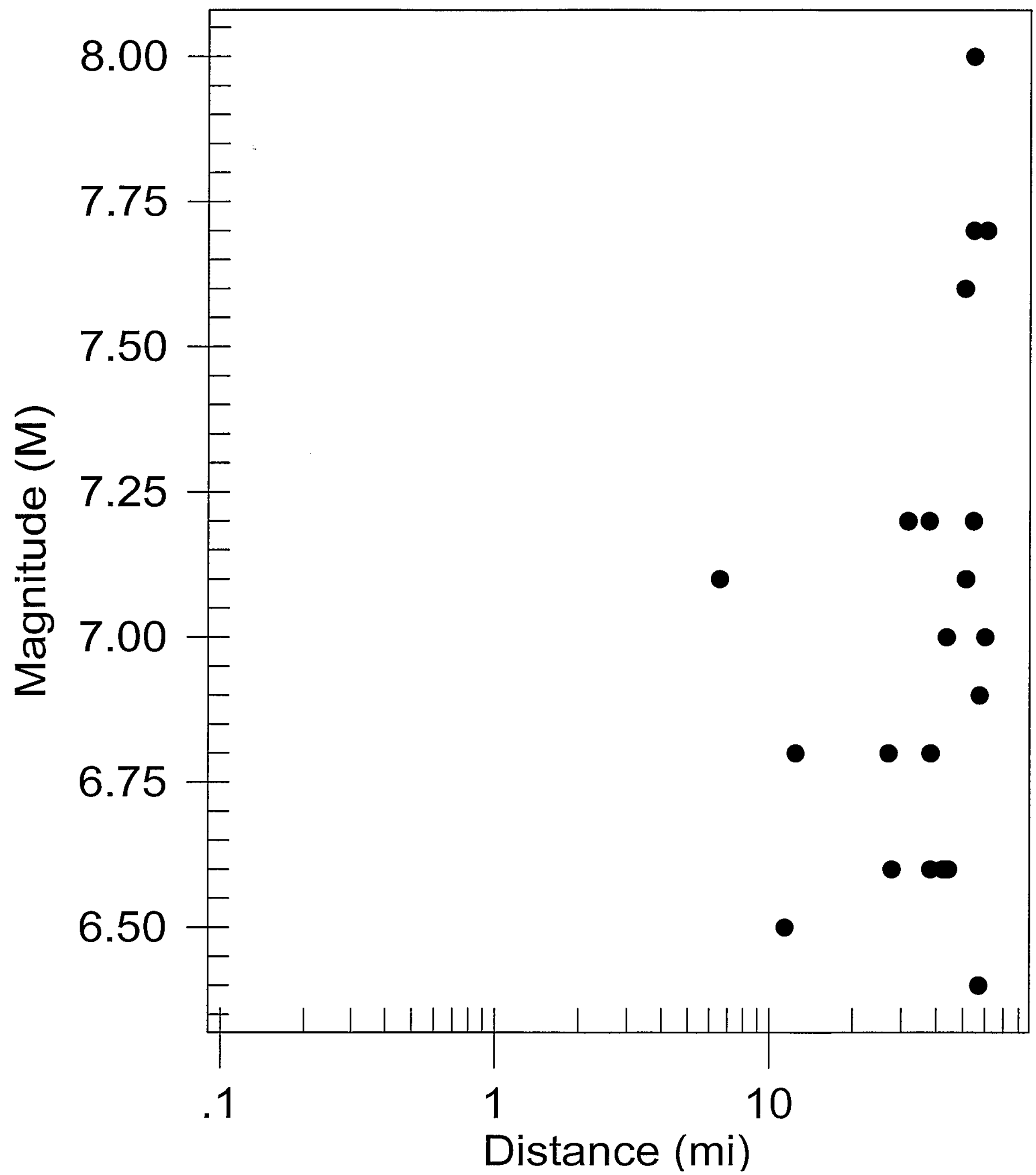
MAXIMUM EARTHQUAKES

Cuyamaca-Paso Picacho



EARTHQUAKE MAGNITUDES & DISTANCES

Cuyamaca-Paso Picacho



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*                       *
*     E Q S E A R C H   *
*                       *
*      Version 3.00     *
*                       *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 0730-020-00
DATE: 01-17-2008

JOB NAME: Cuyamaca-Paso Picacho

EARTHQUAKE-CATALOG-FILE NAME: C:\Program Files\EQSEARCH\ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE: 4.00
   MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
   SITE LATITUDE: 32.9608
   SITE LONGITUDE: 116.5788

SEARCH DATES:

   START DATE: 1800
   END DATE: 2005

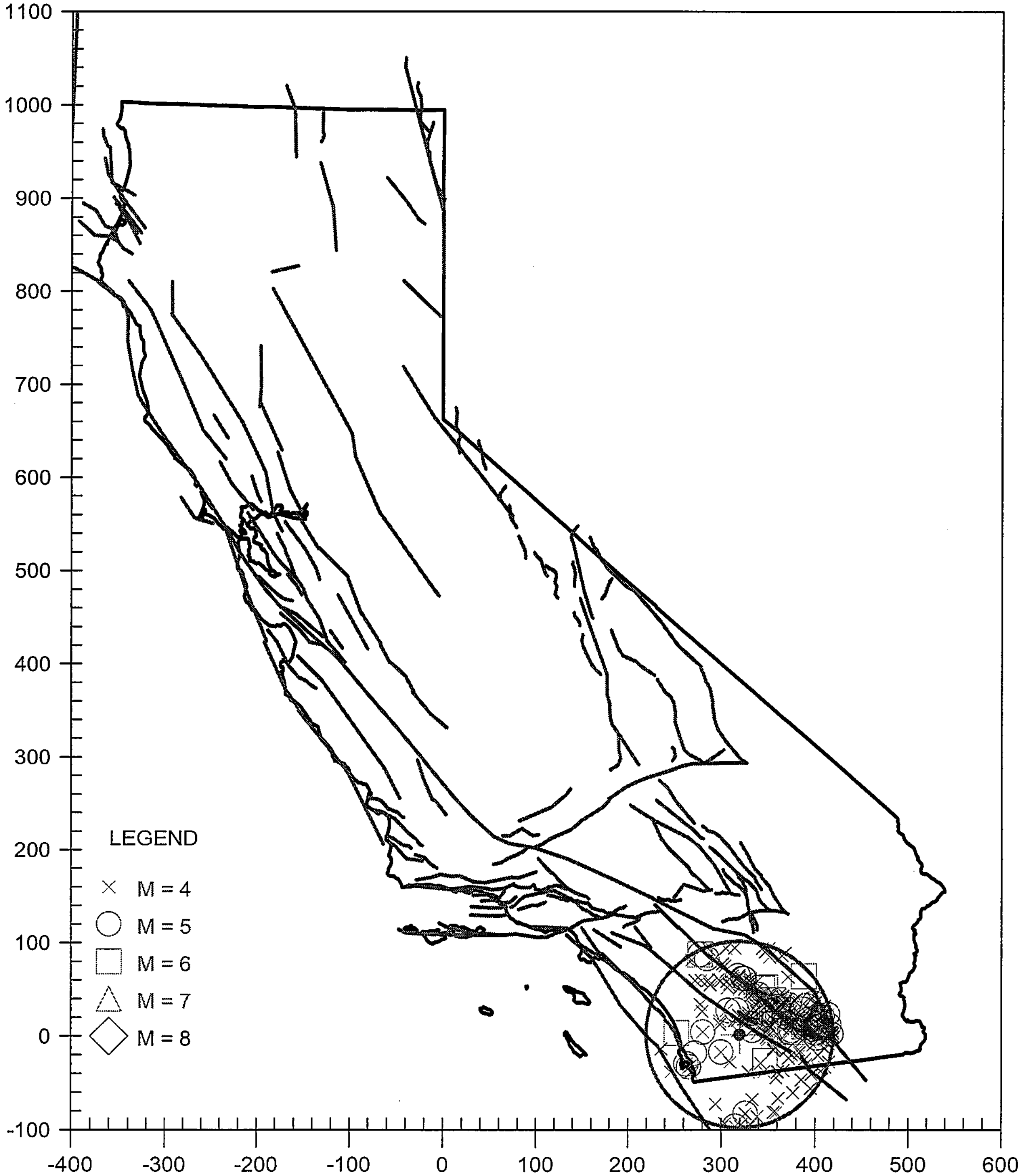
SEARCH RADIUS:
   62.1 mi
   100.0 km

ATTENUATION RELATION: 21) Sadigh et al. (1997) Horiz. - Rock
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   ASSUMED SOURCE TYPE: SS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND: 1 Depth Source: A
   Basement Depth: 5.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

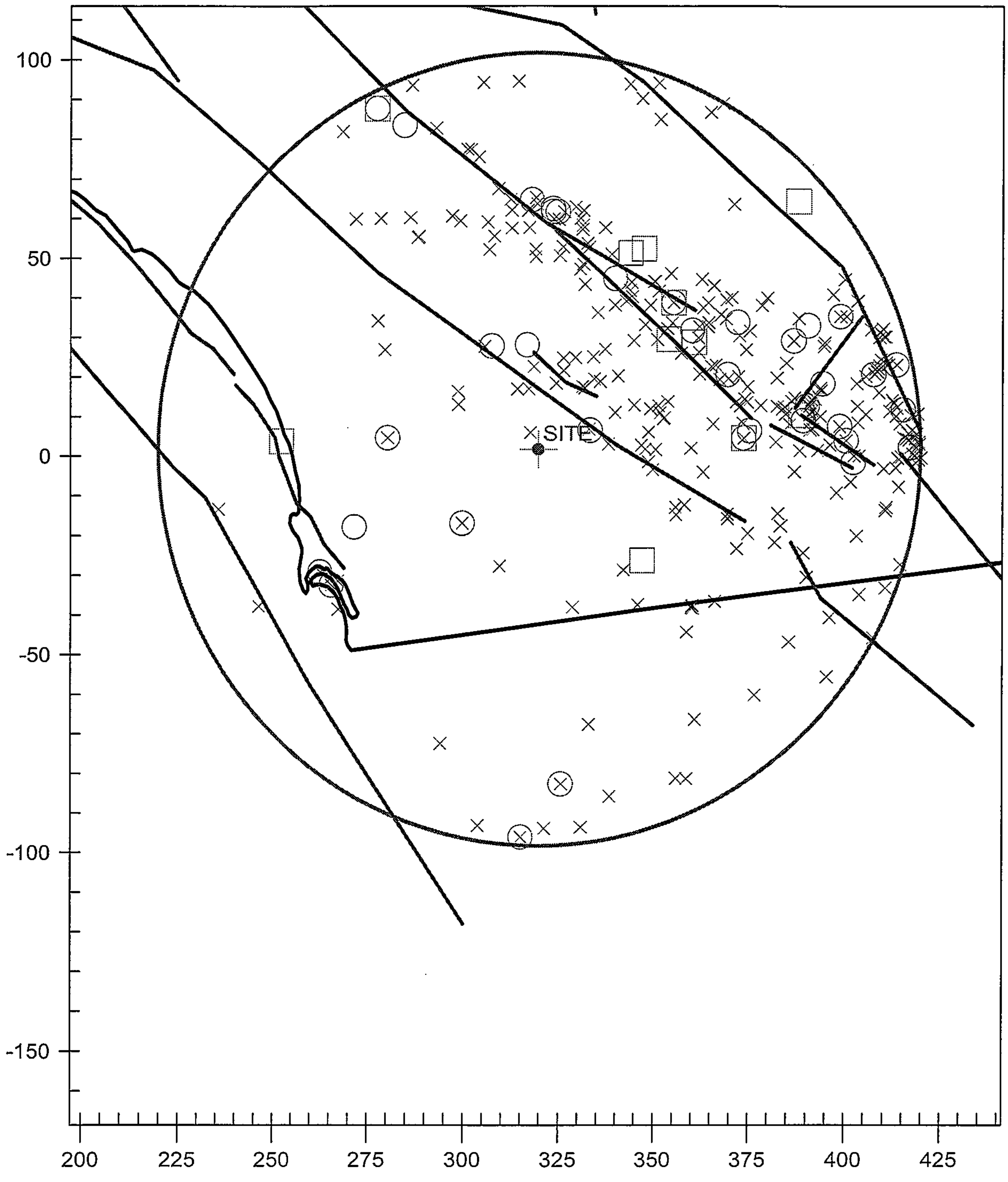
EARTHQUAKE EPICENTER MAP

Cuyamaca-Paso Picacho



EARTHQUAKE EPICENTER MAP

Cuyamaca-Paso Picacho



EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	33.0000	116.6000	06/11/1917	354 0.0	0.0	4.00	0.103	VII	3.0(4.8)
DMG	33.0020	116.4360	07/02/1957	65638.5	12.8	4.10	0.040	V	8.7(14.1)
DMG	33.0000	116.4330	06/04/1940	1035 8.3	0.0	5.10	0.084	VII	8.9(14.3)
MGI	33.1000	116.6000	05/11/1915	1145 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	08/10/1921	2151 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	08/19/1917	710 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	02/05/1922	1915 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	02/16/1915	1330 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	03/04/1915	1250 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	08/10/1921	19 6 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	05/28/1917	1017 0.0	0.0	4.00	0.032	V	9.7(15.6)
MGI	33.1000	116.6000	02/09/1920	220 0.0	0.0	4.00	0.032	V	9.7(15.6)
DMG	33.1000	116.6330	02/08/1952	174028.0	0.0	4.00	0.031	V	10.1(16.3)
DMG	33.1100	116.5230	01/24/1957	205449.9	3.9	4.60	0.046	VI	10.8(17.4)
DMG	32.9670	116.3830	10/31/1942	15 758.0	0.0	4.00	0.026	V	11.3(18.3)
DMG	33.1000	116.4500	11/23/1953	1339 7.0	0.0	4.30	0.031	V	12.2(19.6)
DMG	33.0970	116.4440	08/18/1959	215221.3	17.3	4.30	0.030	V	12.2(19.7)
PAS	33.1380	116.5010	10/10/1984	212258.9	11.6	4.50	0.033	V	13.0(21.0)
DMG	33.1500	116.5830	12/02/1935	319 0.0	0.0	4.00	0.022	IV	13.1(21.0)
DMG	33.0380	116.3610	02/26/1957	211652.2	0.0	4.10	0.022	IV	13.7(22.0)
DMG	33.1170	116.4170	06/04/1940	103656.0	0.0	4.00	0.019	IV	14.3(23.0)
DMG	33.1170	116.4170	10/21/1940	64933.0	0.0	4.50	0.029	V	14.3(23.0)
GSP	33.1100	116.4000	04/01/1984	071702.3	11.0	4.00	0.018	IV	14.6(23.5)
GSP	33.0700	116.8000	12/04/1991	071057.5	15.0	4.20	0.021	IV	14.9(23.9)
DMG	33.1670	116.5000	06/23/1932	22552.7	0.0	4.00	0.018	IV	14.9(24.0)
DMG	33.1670	116.5000	06/23/1932	23037.1	0.0	4.00	0.018	IV	14.9(24.0)
DMG	33.1670	116.4670	08/01/1960	193930.0	0.0	4.20	0.020	IV	15.6(25.2)
MGI	33.1000	116.8000	06/22/1918	557 0.0	0.0	4.00	0.016	IV	16.0(25.8)
MGI	33.2000	116.6000	10/12/1920	1748 0.0	0.0	5.30	0.045	VI	16.6(26.6)
DMG	32.9610	116.2900	08/25/1971	23 033.0	8.0	4.00	0.015	IV	16.7(26.9)
DMG	32.8000	116.8000	10/23/1894	23 3 0.0	0.0	5.70	0.061	VI	17.0(27.3)
MGI	32.8000	116.8000	08/14/1927	1448 0.0	0.0	4.60	0.025	V	17.0(27.3)
DMG	33.0530	116.3060	04/02/1967	201538.6	1.0	4.30	0.019	IV	17.0(27.4)
DMG	33.1670	116.4170	10/14/1935	1550 0.0	0.0	4.00	0.015	IV	17.0(27.4)
DMG	33.1670	116.4170	07/10/1938	18 6 0.0	0.0	4.00	0.015	IV	17.0(27.4)
DMG	33.1670	116.4170	12/05/1939	173352.0	0.0	4.00	0.015	IV	17.0(27.4)
DMG	33.1210	116.3490	05/25/1971	10 252.9	8.0	4.10	0.016	IV	17.3(27.8)
DMG	32.9520	116.2790	09/13/1973	173039.8	8.0	4.80	0.028	V	17.4(28.0)
DMG	33.2000	116.7000	01/01/1920	235 0.0	0.0	5.00	0.032	V	17.9(28.9)
DMG	32.9230	116.2720	10/14/1969	131842.7	10.0	4.50	0.021	IV	18.0(28.9)
DMG	32.9900	116.2680	11/08/1958	132044.1	2.4	4.10	0.014	IV	18.1(29.1)
DMG	33.2000	116.7200	05/12/1930	172548.5	0.0	4.20	0.015	IV	18.4(29.6)
PAS	32.9050	116.2610	12/25/1975	71852.3	3.6	4.00	0.013	III	18.8(30.3)
DMG	32.9500	116.2500	11/14/1951	2355 3.0	0.0	4.10	0.013	III	19.1(30.7)
DMG	33.1830	116.3830	10/14/1949	02925.0	0.0	4.10	0.013	III	19.1(30.7)
DMG	33.0430	116.2600	08/22/1961	231933.6	12.1	4.40	0.017	IV	19.3(31.1)
MGI	32.7000	116.7000	03/21/1918	2325 0.0	0.0	4.00	0.012	III	19.3(31.1)
DMG	33.0330	116.2330	09/20/1961	5 410.0	0.0	4.00	0.011	III	20.6(33.2)
DMG	33.0500	116.2380	08/23/1961	1 047.8	11.9	4.70	0.020	IV	20.7(33.3)
DMG	33.0190	116.2250	08/20/1969	152957.2	0.6	4.00	0.011	III	20.9(33.6)
DMG	33.0210	116.2230	01/13/1963	23938.9	13.0	4.20	0.012	III	21.0(33.8)
PAS	33.0580	116.2110	03/22/1982	85328.6	4.6	4.50	0.015	IV	22.3(35.9)
DMG	33.2000	116.3000	05/12/1930	414 0.0	0.0	4.00	0.009	III	23.1(37.1)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.6800	116.3540	01/21/1970	1124 0.4	8.0	4.10	0.010	III	23.4(37.6)
DMG	33.2670	116.4000	06/06/1940	2321 4.0	0.0	4.00	0.009	III	23.5(37.9)
DMG	32.8170	116.2000	11/22/1953	81138.0	0.0	4.10	0.009	III	24.1(38.8)
DMG	32.7000	116.3000	02/24/1892	720 0.0	0.0	6.70	0.083	VII	24.2(38.9)
MGI	33.0000	117.0000	12/29/1914	10 0 0.0	0.0	4.00	0.008	III	24.5(39.5)
DMG	33.0000	117.0000	03/03/1906	2025 0.0	0.0	4.50	0.013	III	24.5(39.5)
MGI	33.0000	117.0000	09/21/1856	730 0.0	0.0	5.00	0.020	IV	24.5(39.5)
MGI	32.8000	116.2000	07/23/1929	1155 0.0	0.0	4.30	0.011	III	24.6(39.6)
DMG	32.9500	116.1500	10/25/1942	185939.0	0.0	4.00	0.008	III	24.8(40.0)
GSP	32.8220	116.1750	05/24/1992	122225.8	12.0	4.10	0.008	III	25.3(40.7)
MGI	32.6000	116.5000	05/03/1918	425 0.0	0.0	4.00	0.008	II	25.3(40.8)
DMG	33.2830	116.3500	04/13/1949	75336.0	0.0	4.10	0.008	III	25.9(41.6)
DMG	33.2000	116.2330	04/05/1942	92039.0	0.0	4.00	0.007	II	25.9(41.7)
DMG	33.2350	116.2660	04/09/1968	93833.0	5.2	4.00	0.007	II	26.2(42.1)
DMG	32.8940	116.1190	09/16/1961	194939.4	18.5	4.40	0.010	III	27.0(43.5)
DMG	33.3330	116.4330	02/12/1954	94428.0	0.0	4.50	0.011	III	27.0(43.5)
DMG	33.2910	116.3170	03/19/1966	142156.0	10.9	4.00	0.007	II	27.4(44.0)
DMG	33.2000	116.2000	05/28/1892	1115 0.0	0.0	6.30	0.051	VI	27.4(44.2)
DMG	33.1670	116.1670	11/16/1937	1057 0.0	0.0	4.00	0.007	II	27.8(44.7)
PDP	33.2240	116.2030	05/21/2005	003932.7	15.0	4.10	0.007	II	28.3(45.6)
DMG	33.3000	116.3000	01/04/1940	8 711.0	0.0	4.00	0.006	II	28.4(45.7)
DMG	33.0020	116.0850	11/21/1964	172559.7	4.1	4.20	0.007	II	28.7(46.2)
DMG	33.1170	116.1170	06/18/1943	161546.0	0.0	4.50	0.010	III	28.8(46.4)
DMG	33.2790	116.2490	01/07/1966	191023.0	-1.7	4.00	0.006	II	29.1(46.8)
DMG	33.3150	116.3050	04/09/1968	1831 3.8	12.6	4.70	0.011	III	29.1(46.9)
DMG	33.3680	116.4440	03/25/1937	232026.7	10.0	4.00	0.006	II	29.2(46.9)
DMG	32.6000	116.3170	06/15/1946	194653.0	0.0	4.80	0.012	III	29.2(47.0)
MGI	33.2000	117.0000	07/20/1923	7 0 0.0	0.0	4.00	0.006	II	29.4(47.4)
DMG	33.2370	116.1900	04/14/1968	125558.7	10.8	4.30	0.008	II	29.5(47.4)
DMG	33.3430	116.3460	04/28/1969	232042.9	20.0	5.80	0.029	V	29.6(47.7)
GSP	33.3790	116.4350	01/02/2002	121128.7	12.0	4.20	0.007	II	30.0(48.3)
DMG	33.1670	116.1170	04/09/1968	23930.0	0.0	4.40	0.008	III	30.3(48.7)
DMG	33.1670	116.1170	04/09/1968	233 9.0	0.0	4.30	0.007	II	30.3(48.7)
DMG	33.4000	116.5670	02/04/1953	43616.0	0.0	4.30	0.007	II	30.3(48.8)
DMG	33.3330	116.3000	08/06/1933	332 0.0	0.0	4.70	0.011	III	30.3(48.8)
DMG	33.3330	116.3000	08/05/1933	2331 0.0	0.0	4.40	0.008	III	30.3(48.8)
DMG	33.1900	116.1290	04/09/1968	22859.1	11.1	6.40	0.047	VI	30.5(49.0)
DMG	33.4000	116.5000	10/11/1918	4 0 0.0	0.0	4.00	0.006	II	30.7(49.3)
DMG	33.1330	116.0830	10/16/1940	175213.0	0.0	4.00	0.005	II	31.1(50.0)
DMG	33.1330	116.0830	10/06/1940	181953.0	0.0	4.00	0.005	II	31.1(50.0)
DMG	33.1330	116.0830	05/07/1936	1147 0.0	0.0	4.50	0.009	III	31.1(50.0)
DMG	33.1330	116.0830	02/28/1940	1728 7.0	0.0	4.50	0.009	III	31.1(50.0)
DMG	33.2170	116.1330	08/15/1945	175624.0	0.0	5.70	0.025	V	31.3(50.3)
DMG	33.2000	116.1170	12/28/1950	52211.0	0.0	4.20	0.006	II	31.4(50.5)
DMG	33.4170	116.5670	12/22/1950	2 536.0	0.0	4.00	0.005	II	31.5(50.7)
DMG	33.1030	116.0610	04/09/1968	111754.5	4.8	4.00	0.005	II	31.5(50.7)
DMG	33.3100	116.2240	05/22/1968	132655.4	7.5	4.40	0.008	II	31.7(50.9)
PAS	33.1360	116.0710	02/29/1984	2 731.7	6.6	4.30	0.007	II	31.8(51.1)
DMG	33.2830	116.1830	03/19/1954	101957.0	0.0	4.50	0.008	III	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	95429.0	0.0	6.20	0.037	V	31.9(51.4)
DMG	33.2830	116.1830	03/20/1954	6 353.0	0.0	4.30	0.007	II	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	102117.0	0.0	5.50	0.020	IV	31.9(51.4)
DMG	33.2830	116.1830	03/23/1954	41450.0	0.0	5.10	0.014	IV	31.9(51.4)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.2830	116.1830	10/26/1944	225410.0	0.0	4.20	0.006	II	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	957 7.0	0.0	4.60	0.009	III	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	101522.0	0.0	4.50	0.008	III	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	13 8 4.0	0.0	4.30	0.007	II	31.9(51.4)
DMG	33.2830	116.1830	03/20/1954	41919.0	0.0	4.90	0.012	III	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	95556.0	0.0	5.00	0.013	III	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	95748.0	0.0	4.00	0.005	II	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	102610.0	0.0	4.00	0.005	II	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	143750.0	0.0	4.00	0.005	II	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	10 139.0	0.0	4.20	0.006	II	31.9(51.4)
DMG	33.2830	116.1830	04/04/1954	42920.0	0.0	4.10	0.006	II	31.9(51.4)
DMG	33.2830	116.1830	03/19/1954	14 057.0	0.0	4.10	0.006	II	31.9(51.4)
DMG	33.4200	116.4900	03/29/1937	17 316.8	10.0	4.00	0.005	II	32.1(51.7)
MGI	32.8000	117.1000	05/25/1803	0 0 0.0	0.0	5.00	0.013	III	32.2(51.8)
DMG	32.7960	116.0550	11/30/1965	84325.1	16.4	4.00	0.005	II	32.4(52.2)
PAS	33.4200	116.6980	06/05/1978	16 3 3.9	11.9	4.40	0.007	II	32.4(52.2)
DMG	33.3330	116.2360	10/05/1962	1529 2.6	13.9	4.10	0.005	II	32.4(52.2)
GSP	33.2250	116.1130	09/21/2002	212616.6	14.0	4.30	0.007	II	32.5(52.4)
DMG	33.3330	116.2330	06/09/1942	5 633.0	0.0	4.00	0.005	II	32.6(52.4)
DMG	32.7860	116.0550	07/04/1938	215945.3	10.0	4.00	0.005	II	32.7(52.6)
DMG	33.4170	116.4170	01/02/1943	141118.0	0.0	4.50	0.008	II	32.9(52.9)
GSP	33.3990	116.3540	07/26/1997	031456.0	11.0	4.80	0.010	III	32.9(53.0)
DMG	33.1040	116.0360	04/09/1968	34810.3	4.8	4.70	0.009	III	32.9(53.0)
DMG	33.2670	117.0170	06/07/1935	1633 0.0	0.0	4.00	0.005	II	33.0(53.1)
DMG	33.1130	116.0370	04/09/1968	3 353.5	5.0	5.20	0.014	IV	33.1(53.2)
DMG	33.0500	116.0170	08/26/1955	52322.0	0.0	4.30	0.006	II	33.1(53.3)
DMG	33.4260	116.4210	03/25/1937	20 4 8.3	10.0	4.00	0.005	II	33.4(53.7)
DMG	32.9670	116.0000	11/07/1942	439 6.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/22/1942	113951.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/22/1942	181326.0	0.0	5.00	0.012	III	33.5(54.0)
DMG	32.9670	116.0000	11/02/1942	125942.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	11/16/1943	18 9 9.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	02/24/1943	15831.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	162654.0	0.0	5.00	0.012	III	33.5(54.0)
DMG	32.9670	116.0000	10/22/1942	125553.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	214928.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	01/08/1943	024 3.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/29/1942	1556 0.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	04/30/1943	155256.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	08/20/1944	113310.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	191028.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	10/29/1942	162157.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	11/02/1943	175041.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	11/03/1942	101834.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/26/1942	434 4.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	11/02/1943	18 134.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	163439.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	10/29/1942	173552.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	11/02/1943	1753 5.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	162213.0	0.0	6.50	0.044	VI	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	162519.0	0.0	5.00	0.012	III	33.5(54.0)
DMG	32.9670	116.0000	03/07/1943	205631.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	11/02/1943	165716.0	0.0	4.00	0.005	II	33.5(54.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.9670	116.0000	04/27/1943	32833.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	225031.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	11/12/1942	0 737.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/21/1942	1638 6.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	08/17/1943	155058.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	11/02/1943	164759.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	11/03/1942	5 629.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	11/22/1942	63951.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	10/30/1942	53545.0	0.0	4.50	0.007	II	33.5(54.0)
DMG	32.9670	116.0000	04/07/1943	34614.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	32.9670	116.0000	03/26/1943	62957.0	0.0	4.00	0.005	II	33.5(54.0)
DMG	33.0000	116.0000	05/18/1920	625 0.0	0.0	4.50	0.007	II	33.6(54.1)
DMG	33.0400	116.0050	05/11/1968	810 4.0	8.8	4.20	0.006	II	33.7(54.2)
GSP	33.2240	116.0880	07/10/1998	212913.8	12.0	4.10	0.005	II	33.7(54.2)
DMG	33.2330	116.0860	08/26/1965	133814.0	-2.0	4.50	0.007	II	34.1(54.9)
DMG	33.4500	116.6830	04/25/1955	25515.0	0.0	4.00	0.005	I	34.3(55.2)
DMG	33.4000	116.3000	02/09/1890	12 6 0.0	0.0	6.30	0.036	V	34.3(55.3)
DMG	32.9830	115.9830	05/23/1942	154729.0	0.0	5.00	0.011	III	34.5(55.6)
DMG	33.0560	115.9930	04/09/1968	35836.0	7.9	4.30	0.006	II	34.5(55.6)
DMG	33.1070	116.0070	04/09/1968	8 038.5	4.0	4.00	0.004	I	34.6(55.7)
DMG	33.2670	116.1000	01/04/1954	233152.0	0.0	4.20	0.005	II	34.8(56.1)
DMG	33.0480	115.9860	04/16/1968	33029.9	8.3	4.80	0.009	III	34.8(56.1)
DMG	33.4670	116.5830	01/04/1938	029 0.0	0.0	4.50	0.007	II	34.9(56.2)
DMG	33.4670	116.5830	03/27/1937	528 0.0	0.0	4.00	0.004	I	34.9(56.2)
DMG	33.4670	116.5830	03/27/1937	742 0.0	0.0	4.50	0.007	II	34.9(56.2)
DMG	33.4670	116.5830	03/26/1937	2124 0.0	0.0	4.00	0.004	I	34.9(56.2)
GSP	32.5920	116.1650	02/19/1999	030832.2	3.0	4.20	0.005	II	35.0(56.3)
GSP	32.5930	116.1630	04/07/1999	062640.1	8.0	4.00	0.004	I	35.0(56.4)
DMG	33.3490	116.1880	05/19/1969	144033.0	8.6	4.50	0.007	II	35.0(56.4)
DMG	33.4670	116.6330	02/20/1934	1035 0.0	0.0	4.00	0.004	I	35.1(56.5)
GSP	32.5880	116.1670	03/13/1999	133120.4	6.0	4.30	0.006	II	35.1(56.5)
PAS	33.4580	116.4340	02/12/1979	44842.3	3.9	4.20	0.005	II	35.3(56.9)
GSP	32.5870	116.1630	04/18/1999	155301.1	7.0	4.20	0.005	II	35.3(56.9)
DMG	33.0830	115.9830	12/10/1938	312 0.0	0.0	4.00	0.004	I	35.5(57.1)
DMG	33.0830	115.9830	07/14/1940	0 144.0	0.0	4.00	0.004	I	35.5(57.1)
DMG	33.0830	115.9830	07/13/1940	163923.0	0.0	4.00	0.004	I	35.5(57.1)
DMG	33.0830	115.9830	12/15/1937	958 0.0	0.0	4.00	0.004	I	35.5(57.1)
DMG	33.0830	115.9830	03/02/1934	2130 0.0	0.0	4.50	0.007	II	35.5(57.1)
DMG	32.7170	116.0330	06/01/1959	163536.0	0.0	4.60	0.007	II	35.9(57.7)
DMG	33.4080	116.2610	03/25/1937	1649 1.8	10.0	6.00	0.026	V	35.9(57.8)
DMG	33.4670	116.4330	05/12/1939	1925 2.2	0.0	4.50	0.007	II	35.9(57.8)
DMG	33.2780	116.0850	08/26/1965	125351.0	1.0	4.20	0.005	II	36.0(57.9)
PAS	33.4840	116.5130	08/11/1976	152455.5	15.4	4.30	0.005	II	36.3(58.4)
DMG	33.4830	116.5000	02/15/1951	104957.0	0.0	4.80	0.009	III	36.3(58.5)
DMG	33.4830	116.5000	02/15/1951	104759.0	0.0	4.80	0.009	III	36.3(58.5)
PAS	33.4600	116.3700	09/07/1984	175730.3	15.2	4.10	0.004	I	36.5(58.8)
GSP	33.2500	116.0500	08/31/1990	033800.0	8.0	4.20	0.005	II	36.5(58.8)
DMG	32.7500	116.0000	02/19/1919	458 0.0	0.0	4.50	0.006	II	36.6(58.9)
DMG	33.4830	116.7000	12/28/1948	125341.0	0.0	4.00	0.004	I	36.7(59.1)
DMG	33.2400	116.0360	04/28/1961	63021.2	-1.2	4.20	0.005	II	36.8(59.3)
DMG	33.0390	115.9490	05/06/1968	173147.6	6.7	4.00	0.004	I	36.9(59.3)
PAS	33.4830	116.4380	07/02/1988	02658.2	12.6	4.00	0.004	I	37.0(59.5)
DMG	33.1670	115.9830	07/21/1940	836 3.0	0.0	4.40	0.006	II	37.3(60.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.6000	116.1000	12/24/1941	73012.0	0.0	4.50	0.006	II	37.3(60.1)
DMG	33.2000	116.0000	08/15/1951	1227 9.0	0.0	4.00	0.004	I	37.3(60.1)
DMG	32.5330	116.1830	11/12/1939	1849 0.0	0.0	4.00	0.004	I	37.4(60.2)
DMG	32.5330	116.1830	02/22/1939	1030 0.0	0.0	4.00	0.004	I	37.4(60.2)
PAS	33.5010	116.5130	02/25/1980	104738.5	13.6	5.50	0.015	IV	37.5(60.3)
DMG	33.5000	116.5000	09/30/1916	211 0.0	0.0	5.00	0.010	III	37.5(60.4)
DMG	33.5000	116.4830	02/23/1941	183614.0	0.0	4.50	0.006	II	37.6(60.6)
DMG	33.5060	116.5850	05/21/1967	144234.4	19.4	4.70	0.007	II	37.6(60.6)
DMG	33.3330	116.1000	06/12/1943	192141.0	0.0	4.00	0.004	I	37.8(60.8)
DMG	33.5080	116.6310	08/11/1967	05711.4	10.7	4.10	0.004	I	37.9(61.0)
GSP	33.5080	116.5140	10/31/2001	075616.6	15.0	5.10	0.010	III	38.0(61.1)
DMG	33.2310	116.0040	05/26/1957	155933.6	15.1	5.00	0.009	III	38.1(61.3)
DMG	33.4880	116.7770	06/12/1959	11 313.0	5.7	4.00	0.004	I	38.2(61.4)
DMG	33.5010	116.4290	02/23/1971	0 739.2	8.0	4.20	0.004	I	38.3(61.6)
DMG	33.3170	116.0670	09/04/1944	125528.0	0.0	4.10	0.004	I	38.5(61.9)
PAS	32.6790	117.1510	06/18/1985	32228.7	5.7	4.00	0.004	I	38.5(61.9)
DMG	33.2830	116.0330	03/29/1951	233929.0	0.0	4.40	0.005	II	38.6(62.1)
DMG	33.2830	116.0330	03/16/1949	18 027.0	0.0	4.00	0.004	I	38.6(62.1)
PAS	33.5200	116.5580	08/02/1975	014 7.7	13.4	4.70	0.007	II	38.6(62.2)
GSP	33.5100	116.4500	02/18/1990	155259.9	9.0	4.10	0.004	I	38.6(62.2)
DMG	32.9550	115.9110	04/10/1967	04717.3	4.4	4.00	0.004	I	38.7(62.3)
DMG	33.4540	116.8980	07/29/1936	142252.8	10.0	4.00	0.004	I	38.7(62.3)
DMG	33.4560	116.8960	06/16/1938	55916.9	10.0	4.00	0.004	I	38.8(62.4)
GSP	33.2100	115.9700	07/19/1991	024136.8	3.0	4.00	0.004	I	39.2(63.1)
PDP	33.5290	116.5720	06/12/2005	154146.5	14.0	5.20	0.011	III	39.2(63.1)
MGI	33.5000	116.8000	05/31/1917	435 0.0	0.0	4.00	0.004	I	39.4(63.3)
MGI	33.5000	116.8000	11/26/1916	17 5 0.0	0.0	4.00	0.004	I	39.4(63.3)
MGI	33.5000	116.8000	03/30/1918	16 5 0.0	0.0	4.60	0.006	II	39.4(63.3)
MGI	33.5000	116.8000	06/02/1917	435 0.0	0.0	4.00	0.004	I	39.4(63.3)
DMG	33.0360	115.9030	10/05/1964	121 9.5	-2.0	4.10	0.004	I	39.5(63.5)
DMG	33.2880	116.0180	07/27/1965	14 441.4	0.6	4.30	0.005	II	39.5(63.6)
DMG	33.5340	116.5610	09/23/1956	112441.9	12.2	4.30	0.005	II	39.6(63.7)
DMG	33.5330	116.6330	09/21/1942	7 754.0	0.0	4.00	0.004	I	39.6(63.8)
T-A	32.6700	117.1700	10/21/1862	0 0 0.0	0.0	5.00	0.009	III	39.7(64.0)
T-A	32.6700	117.1700	04/15/1865	840 0.0	0.0	4.30	0.005	II	39.7(64.0)
T-A	32.6700	117.1700	12/00/1856	0 0 0.0	0.0	5.00	0.009	III	39.7(64.0)
T-A	32.6700	117.1700	01/25/1863	1020 0.0	0.0	4.30	0.005	II	39.7(64.0)
T-A	32.6700	117.1700	05/24/1865	0 0 0.0	0.0	5.00	0.009	III	39.7(64.0)
DMG	32.7920	115.9140	10/12/1936	135631.8	10.0	4.00	0.003	I	40.3(64.8)
PAS	33.0290	115.8880	11/26/1987	1739 2.0	1.8	4.30	0.004	I	40.3(64.8)
DMG	32.7000	117.2000	05/27/1862	20 0 0.0	0.0	5.90	0.019	IV	40.3(64.8)
MGI	32.7000	117.2000	09/08/1915	742 0.0	0.0	4.00	0.003	I	40.3(64.8)
MGI	32.7000	117.2000	05/20/1920	1330 0.0	0.0	4.00	0.003	I	40.3(64.8)
MGI	32.7000	117.2000	04/19/1906	028 0.0	0.0	4.30	0.004	I	40.3(64.8)
DMG	33.1000	115.9000	04/25/1957	2249 0.0	0.0	4.20	0.004	I	40.4(65.1)
DMG	33.1000	115.9000	04/25/1957	22 5 0.0	0.0	4.20	0.004	I	40.4(65.1)
DMG	33.1000	115.9000	04/25/1957	2248 0.0	0.0	4.10	0.004	I	40.4(65.1)
PAS	33.0170	115.8810	11/24/1987	185040.3	0.0	4.30	0.004	I	40.6(65.3)
DMG	33.0330	115.8830	08/27/1945	112520.0	0.0	4.00	0.003	I	40.6(65.3)
PAS	32.6150	117.1520	10/29/1986	23815.3	14.6	4.10	0.004	I	40.9(65.9)
PAS	32.9930	115.8720	11/24/1987	133259.9	0.0	4.20	0.004	I	41.0(66.0)
GSP	32.7270	115.9260	01/13/1999	132056.0	2.0	4.40	0.005	II	41.2(66.2)
DMG	32.7640	115.9080	10/12/1936	17 750.1	10.0	4.00	0.003	I	41.2(66.3)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	33.5580	116.6670	06/15/1982	234921.3	12.2	4.80	0.007	II	41.5(66.9)
DMG	32.8850	115.8650	10/27/1963	145822.4	-2.0	4.40	0.005	II	41.7(67.1)
DMG	33.0450	115.8630	12/17/1968	225351.2	8.0	4.70	0.006	II	41.8(67.3)
DMG	33.0000	117.3000	11/22/1800	2130 0.0	0.0	6.50	0.031	V	41.9(67.4)
DMG	33.5000	116.9170	11/04/1935	355 0.0	0.0	4.50	0.005	II	42.0(67.6)
DMG	33.0530	115.8550	10/05/1964	12455.5	0.0	4.40	0.004	I	42.4(68.2)
PAS	32.9320	115.8470	09/05/1982	52126.6	4.2	4.40	0.004	I	42.4(68.3)
PAS	33.1330	115.8730	11/24/1987	133355.8	0.0	4.00	0.003	I	42.5(68.5)
DMG	33.2670	115.9330	12/30/1960	214025.0	0.0	4.00	0.003	I	42.9(69.1)
PAS	33.0130	115.8390	11/24/1987	131556.5	2.4	6.00	0.019	IV	43.0(69.2)
DMG	33.0000	115.8330	01/08/1946	185418.0	0.0	5.40	0.011	III	43.3(69.6)
DMG	32.3330	116.4670	01/13/1935	224 0.0	0.0	4.00	0.003	I	43.8(70.5)
DMG	33.0330	115.8210	09/30/1971	224611.3	8.0	5.10	0.008	III	44.2(71.1)
PAS	32.9790	115.8160	11/25/1987	135410.0	0.6	4.20	0.003	I	44.2(71.1)
PAS	33.0360	115.8200	11/24/1987	21435.5	4.7	4.50	0.005	II	44.2(71.2)
PAS	32.9960	115.8160	11/27/1987	11010.5	6.0	4.70	0.005	II	44.2(71.2)
DMG	33.2830	115.9170	03/28/1952	11622.0	0.0	4.20	0.003	I	44.3(71.2)
PAS	33.0140	115.8150	11/24/1987	131848.9	6.0	4.10	0.003	I	44.4(71.4)
PAS	32.9950	115.8130	12/02/1987	4 3 6.2	1.7	4.00	0.003	I	44.4(71.5)
DMG	33.5000	117.0000	08/08/1925	1013 0.0	0.0	4.50	0.005	I	44.5(71.6)
PAS	33.0330	115.8140	11/24/1987	22159.6	4.5	4.00	0.003	I	44.6(71.7)
PAS	32.9800	115.8090	11/28/1987	03910.9	0.8	4.20	0.003	I	44.6(71.8)
PAS	33.0400	115.8120	11/24/1987	253 0.7	3.5	4.70	0.005	II	44.7(72.0)
PAS	33.0220	115.8080	11/24/1987	62323.1	3.4	4.00	0.003	I	44.8(72.1)
DMG	33.1830	115.8500	04/25/1957	222412.0	0.0	5.10	0.008	II	44.9(72.2)
DMG	33.1830	115.8500	04/25/1957	222148.0	0.0	4.20	0.003	I	44.9(72.2)
PAS	33.0470	115.8080	11/24/1987	143629.9	0.0	4.00	0.003	I	45.0(72.5)
DMG	32.9310	115.7980	01/12/1972	1231 9.6	0.0	4.00	0.003	I	45.3(72.9)
PAS	33.0500	115.8000	11/24/1987	21647.2	6.0	4.00	0.003	I	45.5(73.2)
PAS	33.0480	115.7980	11/24/1987	21523.2	5.0	4.80	0.006	II	45.6(73.4)
DMG	32.7000	115.8500	11/01/1941	142434.0	0.0	4.00	0.003	I	46.0(74.0)
PAS	33.0080	115.7860	11/24/1987	1321 0.2	6.0	4.10	0.003	I	46.0(74.1)
PAS	33.0720	115.7820	11/24/1987	153 3.2	4.2	4.00	0.003	-	46.8(75.3)
PAS	33.0670	115.7810	11/24/1987	13248.1	4.0	4.20	0.003	I	46.8(75.3)
T-A	33.5000	117.0700	12/29/1880	7 0 0.0	0.0	4.30	0.003	I	46.8(75.3)
GSP	33.6320	116.7190	07/19/1999	220927.5	14.0	4.20	0.003	I	47.0(75.7)
DMG	33.2330	115.8330	06/14/1942	213623.0	0.0	4.00	0.003	-	47.1(75.7)
DMG	33.2330	115.8330	06/14/1942	222549.0	0.0	4.00	0.003	-	47.1(75.7)
DMG	33.2330	115.8330	06/24/1942	235240.0	0.0	4.00	0.003	-	47.1(75.7)
PAS	33.0820	115.7750	11/24/1987	15414.5	4.9	5.80	0.013	III	47.3(76.1)
PAS	32.9420	115.7630	11/24/1987	133439.9	14.0	4.80	0.005	II	47.3(76.1)
USG	32.6450	115.8440	02/28/1988	5 259.5	7.1	4.21	0.003	I	47.9(77.1)
DMG	33.2160	115.8080	04/25/1957	215738.7	-0.3	5.20	0.008	II	47.9(77.1)
GSP	33.6500	116.7400	12/02/1989	231647.8	14.0	4.20	0.003	I	48.5(78.0)
DMG	33.6500	116.7500	09/05/1950	191956.0	0.0	4.80	0.005	II	48.6(78.2)
PAS	32.3020	116.8810	08/19/1978	931 5.7	19.8	4.10	0.003	I	48.8(78.5)
DMG	32.8330	115.7500	02/24/1933	1933 0.0	0.0	4.50	0.004	I	48.8(78.6)
DMG	32.9830	115.7330	01/24/1951	717 2.6	0.0	5.60	0.010	III	49.0(78.9)
DMG	32.9830	115.7330	01/24/1951	733 7.0	0.0	4.00	0.002	-	49.0(78.9)
DMG	33.1670	115.7670	05/10/1955	43840.0	0.0	4.30	0.003	I	49.1(79.0)
DMG	32.3340	116.1700	08/24/1963	204749.5	4.8	4.10	0.003	-	49.4(79.4)
DMG	33.1750	115.7640	10/28/1963	81417.1	0.9	4.00	0.002	-	49.4(79.5)
DMG	32.9500	115.7170	06/14/1953	42958.0	0.0	4.80	0.005	II	49.9(80.4)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.9500	115.7170	06/14/1953	41729.9	0.0	5.50	0.009	III	49.9(80.4)
MGI	33.5000	116.0000	09/30/1916	425 0.0	0.0	4.00	0.002	-	50.0(80.5)
DMG	32.5000	115.9000	06/25/1941	1715 0.0	0.0	4.00	0.002	-	50.7(81.5)
DMG	32.8560	115.7100	09/18/1936	144032.1	10.0	4.50	0.004	I	50.9(81.9)
DMG	32.9000	115.7000	10/02/1928	19 1 0.0	0.0	5.00	0.006	II	51.1(82.2)
DMG	32.9150	115.6970	05/23/1963	63635.7	1.2	4.30	0.003	I	51.2(82.4)
PAS	32.6270	117.3770	06/29/1983	8 836.4	5.0	4.60	0.004	I	51.7(83.3)
PAS	32.9140	115.6840	01/28/1988	254 2.4	5.9	4.70	0.004	I	51.9(83.6)
DMG	32.9900	115.6820	11/29/1964	142526.4	13.8	4.20	0.003	-	52.0(83.6)
DMG	32.3830	116.0000	01/03/1956	1424 1.0	0.0	4.70	0.004	I	52.2(84.0)
DMG	33.0270	115.6810	05/23/1963	1553 1.8	0.4	4.80	0.004	I	52.2(84.0)
DMG	32.2000	116.5500	11/11/1949	1354 0.0	0.0	4.20	0.003	-	52.6(84.6)
DMG	32.2000	116.5500	11/05/1949	43524.0	0.0	5.10	0.006	II	52.6(84.6)
DMG	32.2000	116.5500	11/04/1949	204238.0	0.0	5.70	0.010	III	52.6(84.6)
DMG	32.2000	116.5500	11/05/1949	20 2 7.0	0.0	4.00	0.002	-	52.6(84.6)
DMG	32.2000	116.5500	11/06/1949	23 510.0	0.0	4.00	0.002	-	52.6(84.6)
PAS	33.0790	115.6800	04/26/1981	124043.4	6.0	4.20	0.002	-	52.7(84.8)
DMG	32.8500	117.4830	02/23/1943	92112.0	0.0	4.00	0.002	-	53.0(85.2)
PAS	33.7010	116.8370	08/22/1979	2 136.3	5.0	4.10	0.002	-	53.2(85.7)
DMG	33.2330	115.7170	10/22/1942	15038.0	0.0	5.50	0.008	III	53.3(85.7)
DMG	33.2330	115.7170	10/26/1942	3 215.0	0.0	4.50	0.003	I	53.3(85.7)
DMG	33.2330	115.7170	10/26/1942	34316.0	0.0	4.00	0.002	-	53.3(85.7)
DMG	33.2330	115.7170	10/26/1942	615 4.0	0.0	4.50	0.003	I	53.3(85.7)
DMG	33.0080	115.6600	06/17/1965	74013.5	8.8	4.10	0.002	-	53.3(85.8)
DMG	32.7330	115.7000	04/21/1960	233920.0	0.0	4.20	0.002	-	53.3(85.8)
DMG	33.2840	115.7350	10/27/1963	145023.4	-2.0	4.00	0.002	-	53.6(86.3)
DMG	32.5510	115.7850	01/23/1971	22 736.0	8.0	4.10	0.002	-	54.1(87.0)
DMG	33.2330	115.7000	08/30/1946	111645.0	0.0	4.60	0.003	I	54.2(87.2)
PAS	33.0940	115.6550	06/13/1979	194645.9	6.0	4.10	0.002	-	54.3(87.3)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.005	II	55.4(89.2)
MGI	33.7000	116.2000	08/12/1917	11 0 0.0	0.0	4.00	0.002	-	55.5(89.3)
DMG	32.1670	116.4170	09/17/1950	194330.0	0.0	4.50	0.003	I	55.6(89.5)
PAS	33.0980	115.6320	04/26/1981	12 928.4	3.8	5.70	0.009	III	55.6(89.5)
PAS	33.0990	115.6300	04/26/1981	12 557.4	4.2	4.00	0.002	-	55.7(89.7)
DMG	33.0560	115.6200	06/16/1965	242 6.1	-0.5	4.40	0.003	I	55.9(90.0)
DMG	32.8830	115.6170	01/16/1946	11 654.0	0.0	4.20	0.002	-	56.0(90.1)
PAS	33.1100	115.6270	04/25/1981	21155.3	4.8	4.10	0.002	-	56.0(90.2)
PAS	32.2020	116.2290	12/12/1979	213741.0	5.5	4.00	0.002	-	56.2(90.4)
PAS	33.1030	115.6220	11/04/1976	133127.7	3.7	4.20	0.002	-	56.2(90.5)
PAS	33.1030	115.6210	11/04/1976	1139 8.4	0.9	4.10	0.002	-	56.3(90.6)
GSP	33.3170	115.7000	11/13/2001	204315.0	5.0	4.10	0.002	-	56.4(90.8)
PAS	33.1090	115.6190	11/04/1976	114940.4	2.2	4.10	0.002	-	56.5(90.9)
DMG	32.6000	115.7000	12/19/1958	1437 0.0	0.0	4.10	0.002	-	56.8(91.4)
DMG	32.6000	115.7000	04/26/1963	1 342.0	0.0	4.00	0.002	-	56.8(91.4)
DMG	33.2670	115.6670	08/10/1951	1130 8.0	0.0	4.40	0.003	-	56.8(91.4)
PAS	33.1170	115.6150	04/26/1976	64637.5	14.8	4.00	0.002	-	56.8(91.4)
DMG	32.2000	116.2000	03/03/1957	11 6 3.0	0.0	4.40	0.003	-	57.0(91.7)
PAS	32.7880	115.6180	10/15/1979	2355 2.6	5.0	4.20	0.002	-	57.0(91.7)
DMG	32.7940	115.6150	04/23/1968	1624 9.5	5.0	4.10	0.002	-	57.1(91.8)
DMG	33.2000	115.6330	10/27/1963	145245.2	-2.0	4.10	0.002	-	57.2(92.0)
DMG	33.1310	115.6110	10/27/1963	181250.7	7.8	4.20	0.002	-	57.2(92.1)
DMG	33.0120	115.5920	04/11/1965	04646.1	-2.0	4.10	0.002	-	57.3(92.1)
T-A	33.5000	115.8200	05/00/1868	0 0 0.0	0.0	6.30	0.015	IV	57.5(92.5)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	33.7500	116.2500	11/19/1917	1730 0.0	0.0	4.00	0.002	-	57.7(92.8)
DMG	33.0370	115.5840	06/17/1965	73020.9	-1.3	4.30	0.002	-	57.8(93.1)
PAS	33.1170	115.5950	11/04/1976	141250.2	5.0	4.40	0.003	-	58.0(93.3)
DMG	33.8000	116.6000	09/10/1931	436 0.0	0.0	4.00	0.002	-	58.0(93.3)
DMG	32.8830	115.5830	04/13/1938	1929 0.0	0.0	4.50	0.003	I	58.0(93.3)
PAS	33.1180	115.5950	11/04/1976	62110.7	5.0	4.10	0.002	-	58.0(93.3)
PAS	33.1230	115.5960	11/04/1976	54820.9	5.0	4.20	0.002	-	58.0(93.3)
PAS	33.1810	115.6110	03/07/1989	02458.2	2.8	4.10	0.002	-	58.0(93.4)
GSP	33.0300	115.5800	03/24/1989	231648.0	6.0	4.00	0.002	-	58.0(93.4)
PAS	33.0010	115.5760	10/16/1979	74947.2	8.5	4.00	0.002	-	58.1(93.6)
PAS	32.9040	115.5760	10/17/1979	191438.4	15.9	4.10	0.002	-	58.2(93.7)
PAS	33.1180	115.5900	11/04/1976	635 3.5	4.5	4.10	0.002	-	58.2(93.7)
DMG	33.8000	116.7000	08/11/1911	1820 0.0	0.0	4.00	0.002	-	58.4(93.9)
DMG	33.8000	116.7000	08/11/1911	2340 0.0	0.0	4.50	0.003	I	58.4(93.9)
DMG	33.0190	115.5730	06/17/1965	743 5.0	-2.0	4.20	0.002	-	58.4(94.0)
GSP	33.1920	115.6080	12/31/1997	122245.1	10.0	4.10	0.002	-	58.4(94.0)
PAS	32.8390	115.5780	10/15/1979	232552.6	8.1	4.00	0.002	-	58.6(94.3)
DMG	32.9820	115.5660	05/23/1963	9 6 4.7	25.4	4.60	0.003	I	58.7(94.4)
PAS	33.1820	115.5990	03/06/1989	221647.6	1.0	4.30	0.002	-	58.7(94.5)
DMG	32.4170	115.8000	05/13/1960	123640.0	0.0	4.10	0.002	-	58.8(94.6)
PAS	32.9070	115.5660	10/16/1979	114655.3	11.4	4.80	0.004	I	58.8(94.6)
DMG	33.2000	115.6000	11/12/1942	175612.0	0.0	4.00	0.002	-	59.0(94.9)
PAS	33.1820	115.5940	03/07/1989	74344.1	0.5	4.20	0.002	-	59.0(94.9)
PAS	32.9500	115.5570	10/16/1979	33934.3	12.1	4.50	0.003	I	59.2(95.3)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.003	I	59.2(95.3)
DMG	33.7830	116.2830	03/04/1937	16 4 0.0	0.0	4.00	0.002	-	59.3(95.4)
PAS	33.0140	115.5550	10/16/1979	65842.8	9.1	5.50	0.007	II	59.4(95.6)
DMG	32.1000	116.6000	01/07/1950	93735.0	0.0	4.00	0.002	-	59.4(95.7)
DMG	33.1170	115.5670	07/28/1950	1840 0.0	0.0	4.00	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/27/1950	112926.0	0.0	4.80	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	1727 0.0	0.0	4.70	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/29/1950	1714 0.0	0.0	4.30	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/29/1950	143632.0	0.0	5.50	0.007	II	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	175048.0	0.0	5.40	0.006	II	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	1624 0.0	0.0	4.00	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	1817 0.0	0.0	4.20	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	08/01/1950	83720.0	0.0	4.70	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/27/1950	954 0.0	0.0	4.10	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/27/1950	2251 0.0	0.0	4.50	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/29/1950	017 0.0	0.0	4.50	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	325 0.0	0.0	4.70	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	1949 0.0	0.0	4.20	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/29/1950	15 9 0.0	0.0	4.50	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	08/14/1950	1916 0.0	0.0	4.70	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	1730 0.0	0.0	4.10	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	2113 0.0	0.0	4.10	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/29/1950	1843 0.0	0.0	4.70	0.003	I	59.5(95.8)
DMG	33.1170	115.5670	07/27/1950	12 2 0.0	0.0	4.20	0.002	-	59.5(95.8)
DMG	33.1170	115.5670	07/28/1950	175812.0	0.0	4.80	0.003	I	59.5(95.8)
DMG	32.1000	116.5000	01/08/1937	1246 0.0	0.0	4.00	0.002	-	59.6(95.9)
GSP	32.9480	115.5500	05/24/2003	020429.0	16.0	4.20	0.002	-	59.6(95.9)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.004	I	59.7(96.0)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.022	IV	59.7(96.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.1130	116.7850	04/23/1968	131825.4	10.0	4.20	0.002	-	59.8(96.2)
GSP	33.7110	116.0560	07/14/2004	005352.0	12.0	4.00	0.002	-	59.9(96.4)
PAS	32.9600	115.5440	10/16/1979	31047.1	9.4	4.50	0.003	-	59.9(96.5)
PAS	32.9450	115.5430	10/16/1979	31625.4	7.2	4.10	0.002	-	60.0(96.6)
GSP	32.6120	115.6280	07/27/1992	204008.8	15.0	4.10	0.002	-	60.2(96.9)
PAS	32.9270	115.5400	10/16/1979	54910.2	10.4	5.10	0.005	I	60.2(96.9)
PAS	32.9280	115.5390	10/16/1979	61948.7	9.2	5.10	0.005	I	60.3(97.0)
DMG	32.9670	115.5330	02/13/1951	174634.0	0.0	4.10	0.002	-	60.6(97.5)
DMG	32.9670	115.5330	02/13/1951	1716 0.0	0.0	4.20	0.002	-	60.6(97.5)
DMG	33.0000	115.5330	10/25/1955	174942.0	0.0	4.30	0.002	-	60.6(97.6)
PAS	32.9130	115.5340	10/16/1979	6 439.0	8.0	4.00	0.002	-	60.6(97.6)
PAS	32.9320	115.5300	10/16/1979	61346.5	8.0	4.10	0.002	-	60.8(97.8)
DMG	32.0830	116.6670	10/12/1938	1231 0.0	0.0	4.00	0.002	-	60.8(97.9)
DMG	32.0830	116.6670	09/27/1934	2140 0.0	0.0	4.00	0.002	-	60.8(97.9)
DMG	32.0830	116.6670	11/25/1934	818 0.0	0.0	5.00	0.004	I	60.8(97.9)
DMG	33.7830	116.2000	10/31/1943	131210.0	0.0	4.50	0.003	-	60.8(97.9)
MGI	33.8000	116.9000	04/23/1918	1415 0.0	0.0	4.00	0.002	-	60.8(97.9)
MGI	33.8000	116.9000	04/29/1918	2 0 0.0	0.0	4.00	0.002	-	60.8(97.9)
MGI	33.8000	116.9000	12/18/1920	1726 0.0	0.0	4.00	0.002	-	60.8(97.9)
MGI	33.8000	116.9000	06/14/1918	1024 0.0	0.0	4.00	0.002	-	60.8(97.9)
PAS	32.9090	115.5280	10/16/1979	1 013.9	4.8	4.60	0.003	I	61.0(98.2)
PAS	32.9470	115.5250	10/16/1979	139 3.3	2.0	4.00	0.002	-	61.1(98.3)
PAS	32.8920	115.5260	01/12/1980	2011 6.4	5.0	4.10	0.002	-	61.2(98.5)
PAS	32.9260	115.5230	10/16/1979	11421.3	9.6	4.30	0.002	-	61.2(98.5)
PAS	32.6630	115.5830	10/31/1980	125536.7	3.6	4.40	0.002	-	61.3(98.7)
PAS	32.9580	115.5200	10/16/1979	02214.2	10.0	4.20	0.002	-	61.3(98.7)
PAS	32.8990	115.5190	10/16/1979	72324.2	9.0	4.20	0.002	-	61.6(99.1)
PAS	32.9390	115.5150	10/16/1979	93641.1	9.9	4.00	0.002	-	61.6(99.2)
PAS	32.9340	115.5150	10/16/1979	61160.0	11.0	4.00	0.002	-	61.7(99.2)
PAS	33.0030	115.5140	10/16/1979	65522.9	8.7	4.60	0.003	I	61.7(99.3)
DMG	32.5000	115.6670	02/12/1932	23021.0	0.0	4.00	0.002	-	61.8(99.4)
PAS	32.9030	115.5110	10/21/1977	132424.6	15.5	4.20	0.002	-	62.0(99.8)
GSP	33.7300	116.0200	12/18/1989	062704.5	10.0	4.20	0.002	-	62.1(100.0)

****

-END OF SEARCH- 457 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2005

LENGTH OF SEARCH TIME: 206 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 3.0 MILES (4.8 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 6.8

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.103 g

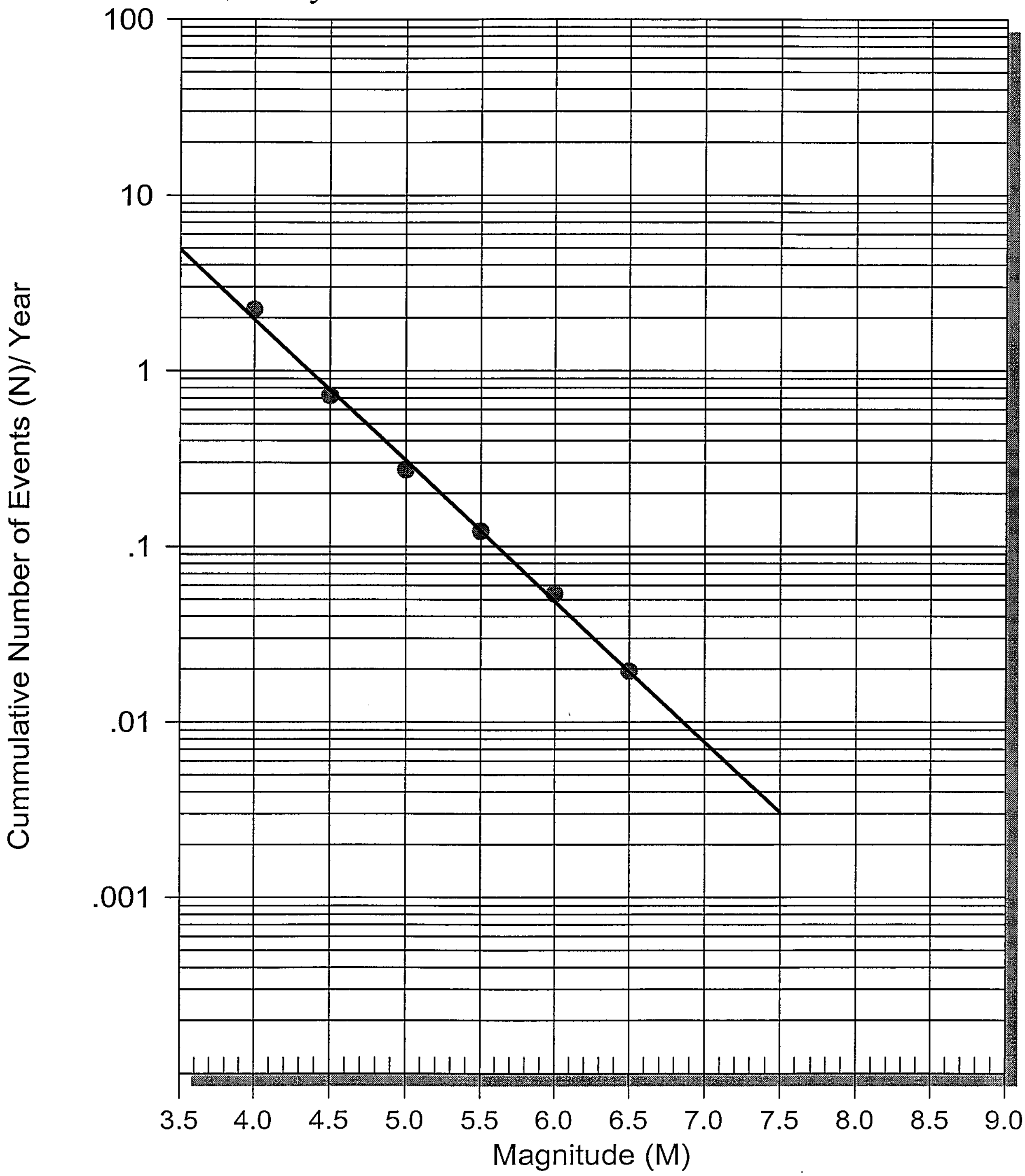
COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value= 3.499
  b-value= 0.802
  beta-value= 1.846

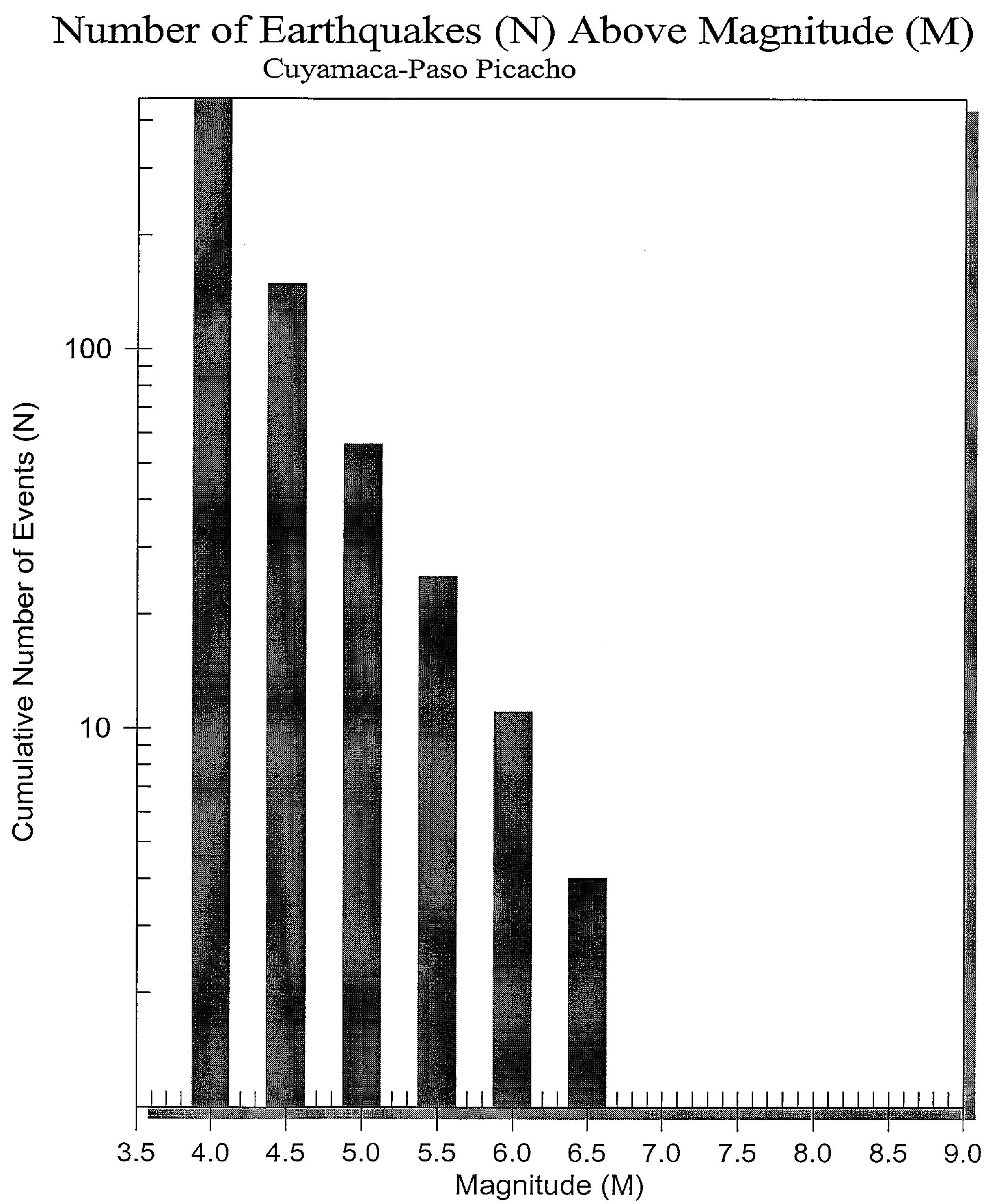
TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	457	2.21845
4.5	148	0.71845
5.0	56	0.27184
5.5	25	0.12136
6.0	11	0.05340
6.5	4	0.01942

EARTHQUAKE RECURRENCE CURVE

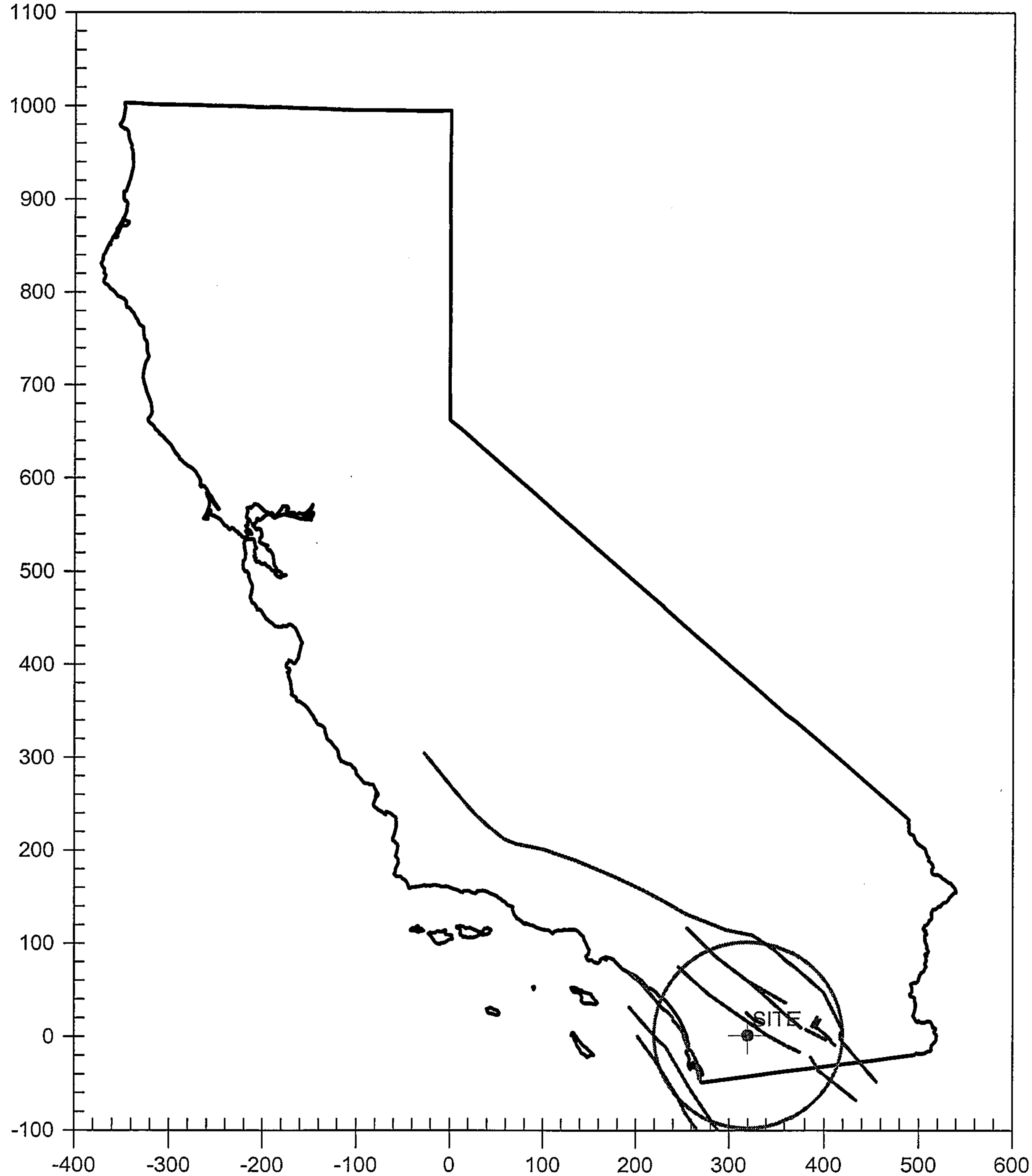
Cuyamaca-Paso Picacho




Number of Earthquakes (N) Above Magnitude (M)
Cuyamaca-Paso Picacho
Cumulative Number of Events (N)
100
10
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
Magnitude (M)

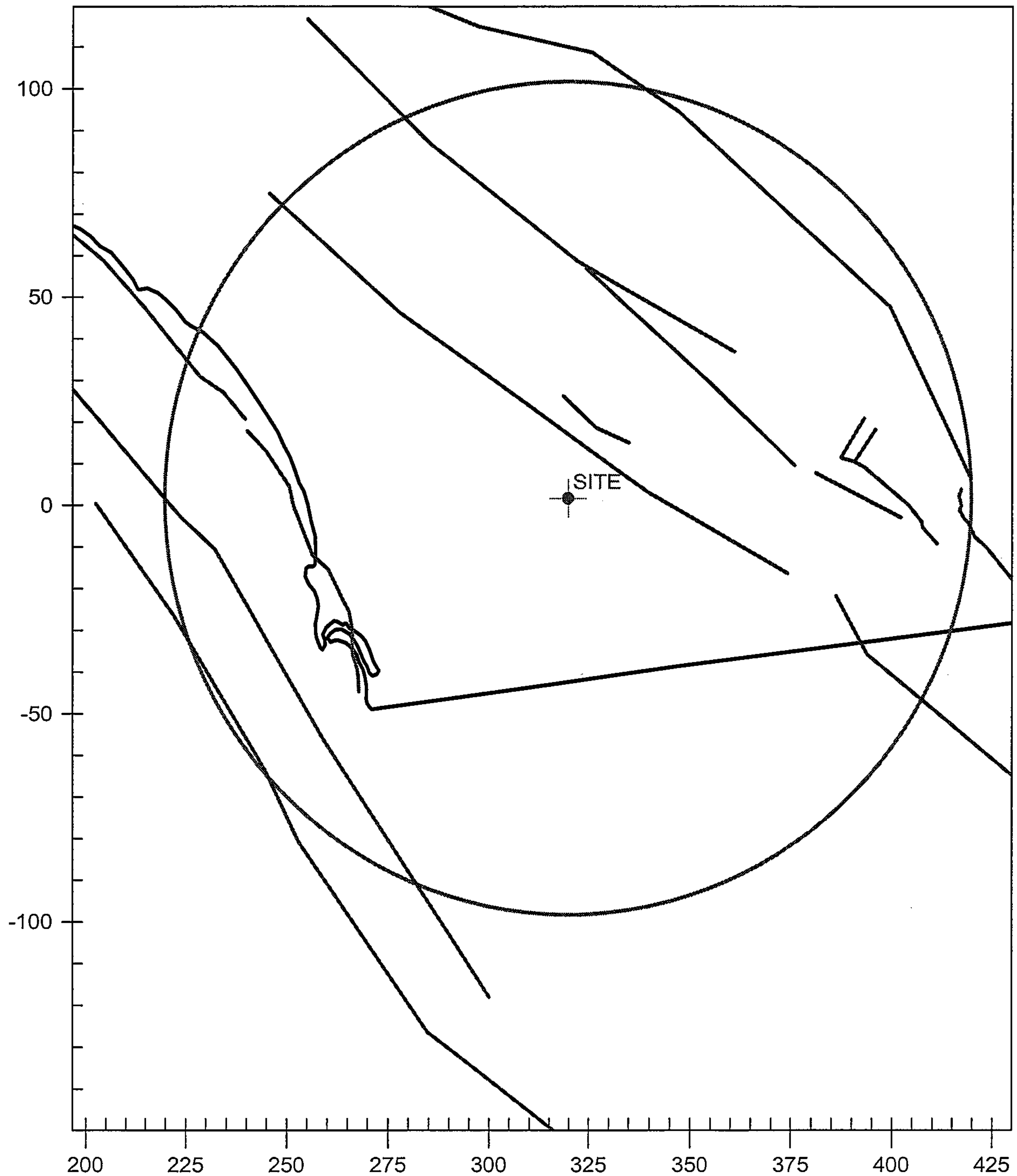
CALIFORNIA FAULT MAP

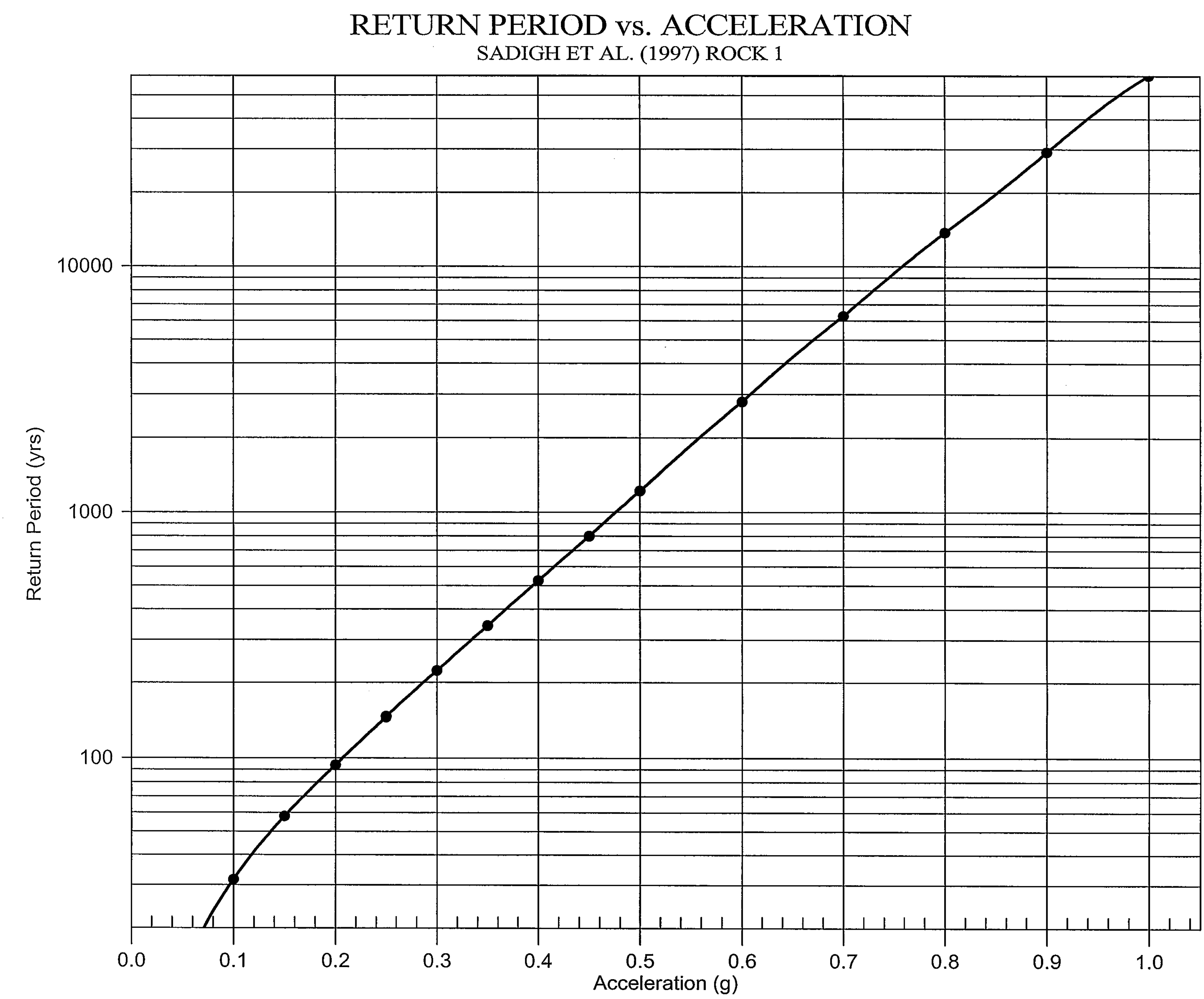
Cuyamaca-Paso Picacho

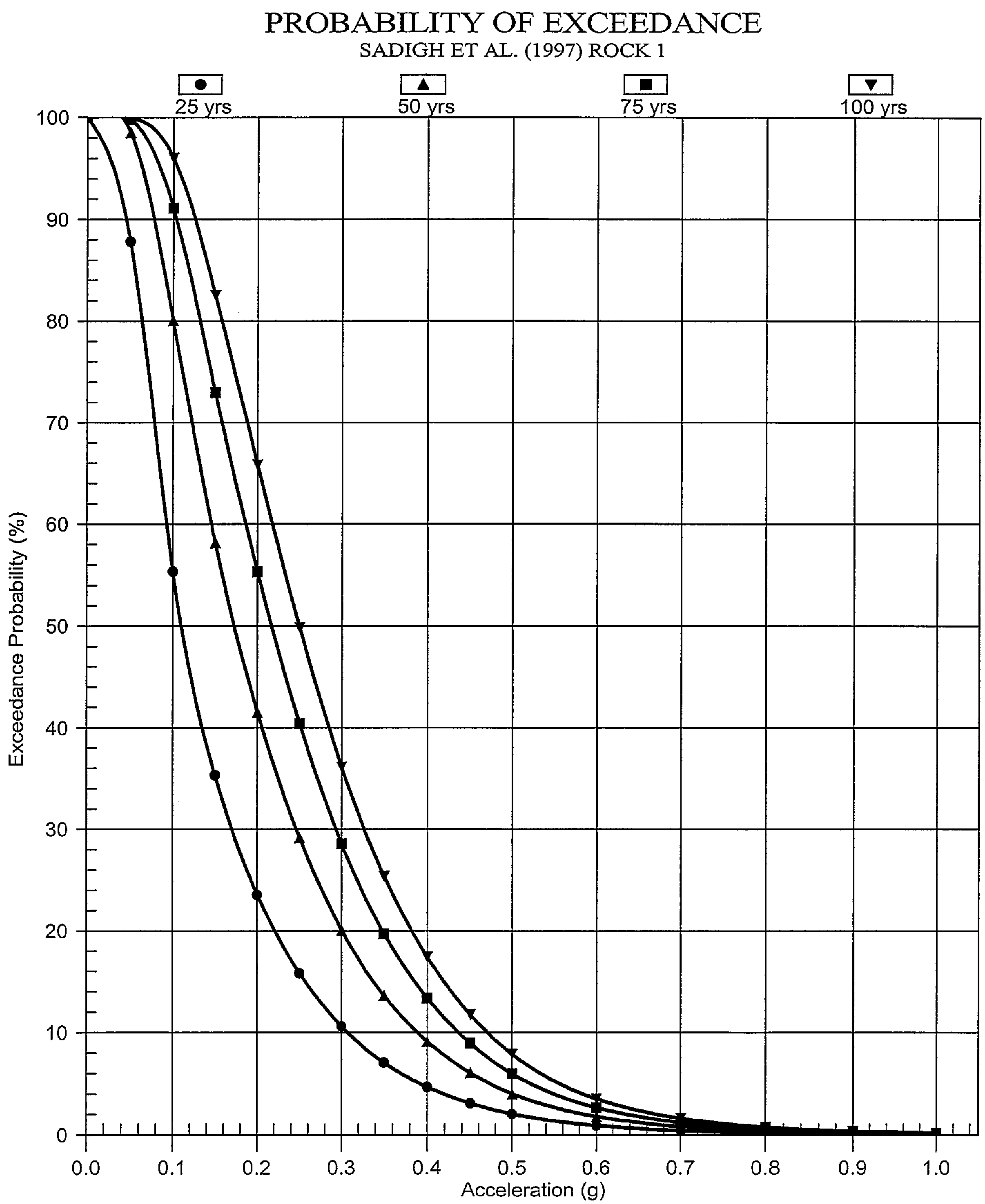


CALIFORNIA FAULT MAP

Cuyamaca-Paso Picacho




RETURN PERIOD vs. ACCELERATION
SADIGH ET AL. (1997) ROCK 1
Return Period (yrs)
10000
1000
100
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Acceleration (g)


PROBABILITY OF EXCEEDANCE
SADIGH ET AL. (1997) ROCK 1
25 yrs
50 yrs
75 yrs
100 yrs
Exceedance Probability (%)
Acceleration (g)
0
10
20
30
40
50
60
70
80
90
100
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0

PROBABILITY OF EXCEEDANCE

SADIGH ET AL. (1997) ROCK 1